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MECHANO-THERAPEUTICS IN GENERAL PRACTICE

MECHANO-THERAPEUTICS IN GENERAL PRACTICE

BY

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WITH 31 ILLUSTRATIONS

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TO MY WIFE

PREFACE

THERE is, unfortunately, still a barrier between a large number of men in general practice, and the application of mechano-therapeutics: the object of this book will be to break down this barrier.

The main reason for the indifference on the part of medical men with regard to this important adjuvant in therapy is probably their ignorance of it, which is largely due to the fact that this subject is not compulsory in the curriculum, and is altogether neglected by the medical schools. So that if there is any knowledge of it among the profession in general, it is only owing to the industry and pluck of a few individuals who freed themselves from the "recognised" ideas and theories.

The fact that in the past the carrying out of these "unapproved" methods largely rested in the hands of scientifically untrained people, naturally helped to bring into discredit everything that was connected with them. Though a great watchfulness in dealing with a new "cure" is always necessary on our part, yet it appears that a passive attitude of the profession towards mechano-therapy only results in losses to the

doctors as well as to their patients, leaving, as usual, a *tertius gaudens*—the quack.

Attempts will be made in the following pages to point out *where* mechano-therapy is likely to prove useful; a word will also be said about the technique. My leading idea will be to make the whole concise and clear, that it should serve as a practical guide to massage in general practice.

THE AUTHOR.

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LONDON, W.,
June, 1914.

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[Printed in England]

TO MY WIFE

To comfort those who think many costly appliances necessary to carry out this kind of treatment, I can only say that here, as well as anywhere else, the best results are achieved by few and simple means. We must always remember that the treatment has often to be administered in private houses under great difficulties. A couch and a pair of skilful hands are all that is really indispensable: they are as important in mechano-therapy as in operative surgery. We often prefer our own fingers to the most wonderful instruments.

Skill is required everywhere. But the skill of an average medical man is quite sufficient to start with, if shyness could only be overcome. Those who play the piano or the violin will find it a useful talent in this respect too. Those who cannot rely on their fingers should leave massage alone altogether, rather than have recourse to vibrators, pulsators, and other similar instruments. It is infinitely more difficult to know what we are doing when we are applying a motor, which is always a clumsy, irresponsive object, than when employing our fingers alone. Those of the profession who have some experience in trephining will, no doubt, agree on this point. But here, as well as there, machines render great services in experienced and reliable hands. They also save a great deal of energy to those who have to do this kind of work during the best part of the day. There is such a variety of vibrators that no one ought to experience the slightest difficulty in satisfying his taste.

With regard to the couch, it is advisable to have it

not too low, and, if possible, covered with some rough material, such as plush. This prevents the patient sliding about, and it feels warmer. Leather or its imitations are less suitable as covering materials, because they are cold, and rather unpleasant for the patient. One or two hard cushions complete the necessary outfit.

No lubricants are really important in massage. They do not reduce the pain, if it is the want of skill that causes it. I should only advise their use in very rare cases in which the skin is very sore.

Those who visit Sweden, the motherland of gymnastics and massage, will be surprised at the simplicity of most of the mechano-therapeutic institutes of Stockholm. And yet the best work is supposed (rightly or wrongly) to be done there.

INDICATIONS

On the whole : *injuries*, such as *fractures* and *sprains*, *deformities*, *simple* and *chronic inflammatory* conditions, and *constitutional diseases*, are those in which mechano-therapy will be found useful, and in most cases more helpful than any of our drugs. The use of drugs, however, is never incompatible with massage, and the two can be safely combined.

CONTRA-INDICATIONS

No acute inflammatory conditions and *no tumours* should ever be directly treated by massage. Tumours

include here all the types of granulomata, such as syphilis, tuberculosis, and actinomycosis, as well as the true forms of new-growths, benign as well as malignant. Rest, the knife or some other applications, are still the best remedies here, in spite of the attempts of some enthusiasts to regard massage as a panacea for all complaints. The latter practice will always bring into disrepute methods otherwise very useful.

Hæmophilia, *leukœmia*, and *aneurysm* also belong to this category.

I. SURGICAL

A. FRACTURES

FRACTURES of the *limbs* are the only class of fractures that may become subject to mechano-therapeutic treatment. Fractures of the skull, the vertebral column, and those of the pelvis are either fatal in most cases or heal best under absolute rest, which is imperative with regard to the important organs that might be injured. Once satisfactorily united, they are not likely to leave any such undesirable traces which could have been prevented. These fractures are also comparatively rare, and are mostly treated in hospitals or nursing-homes, therefore they do not concern us here.

On the other hand, anybody, however little acquainted with general practice, will find sufficient reason to complain about the bad results of some of the commoner fractures of the extremities. Anybody will recall to his memory some case of Pott's or Colles's fracture he has recently met with, which he could not cure by any means.

Most of these cases might have taken an entirely

different course if properly seen to from the first. These patients so often complain about pain and stiffness long after the time considered necessary for the broken bone to regain its continuity and its former strength had passed, that in most cases the injured limbs remain quite useless for another month or two, or even longer.

The fault lies in the old-fashioned method of putting up all kinds of fractures in splints, and leaving them to their own fate, once a satisfactory apposition of the fragments had been achieved. We all know that an accurate position of the bone fragments does not always guarantee subsequent free use of the limb, and I have seen limbs that were crippled in spite of the radiographs showing perfect results. The fixation method, though, perhaps, more convenient in the beginning, will nearly always cause disappointment after a few weeks.

Fractures are becoming less and less a *noli me tangere*. A treatment which was taboo not so very long ago is now making its way through the world. Two great surgeons, Championnière in France, and Bennett in this country, were amongst the first pioneers of the new movement. They were soon to realise the importance of the early application of massage and movements in the management of fractures.

The main object of the new treatment is to prevent *stiffness* and *pain*, the two remote symptoms of all fractures, which are both so tedious in practice. The way in which these complications arise is a very natural and simple one; and so is also the way in which they may be prevented. What we really aim at is the

dispersion of the extravasated blood, since it is the *hæmatoma* that afterwards causes the unpleasant results.

Blood naturally becomes organised and replaced by connective tissue. Ligaments, muscles, tendon-sheaths, and joint-capsules, in fact, any structure, become hard and inelastic from excess of scar-tissue. Our chief object, therefore, must be to *hasten the absorption* of the extravasated material by driving it into the lymphatics. In that way we shall also improve the circulation in the peripheral parts of the injured limb, which so often suffer from imperfect blood-supply, caused partly by the swelling at the site of the fracture, and partly by splints and bandages.

It is a well-known fact that the *joints* and *tendon-sheaths* in the neighbourhood of fractures, though not actually involved in the injury, swell and form effusions, which are often followed by great discomfort, thus complicating the situation still more. This symptom, however, is frequently overlooked at the time of its occurrence, and is only noticed when the patient begins to complain of pain at an unexpected place.

The following lines contain a *general plan of treatment of all fractures. Perfect reduction*, being of first importance for the subsequent results, should be insisted upon in every case where there is *any displacement at all.* When a fracture is seen on the first day, and there is present a sufficient amount of displacement of the fragments to necessitate reduction, this may be found impossible without an anæsthetic, owing to *muscular spasm* and *pain.* In such a case one should always

try to relieve the spasm by means of *very gentle* (*centripetal*) *stroking* carried out over the contracted muscles. One will find that such manipulations have a remarkably soothing effect on the patient, and often render the administration of anæsthetics quite unnecessary. The spasmodically contracted muscles become relaxed, and the pain, which to a great extent is caused by the cramp, is markedly diminished. If now the attempt to reduce the fracture be repeated, it will be found considerably easier.

In order to achieve a complete relaxation of muscles, massage has to be applied for at least fifteen to twenty minutes. The limb is then placed on a *splint*, preferably a removable one, which would permit of an easy and frequent access. As soon as the swelling has ceased to increase, which generally happens on the second or third day, by which time the shock has also subsided, the splints are taken off and the limb submitted to *regular massage*.

Care must be taken to *avoid displacement*. The limb should be placed on a flat surface: the leg on a bed, and the arm on a table. A hard mattress on the former, and a cushion on the latter, will suffice to diminish the pain without favouring the displacement.

Gentle upward stroking of the skin above and below the site of the fracture will have to be applied in all cases, and it is carried out with *both palms alternately*. The parts in contact with the patient are the *thenar*, *hypothenar* and the *palmar surfaces* of the *thumbs* and *fingers*, which all try to embrace the limb (Fig. 1). There ought to be as little pressure exercised as possible,

the movement being more a *gliding* than a pressing one. The aim of stroking is only to empty the superficial veins and lymphatics in the vicinity of the extravasated

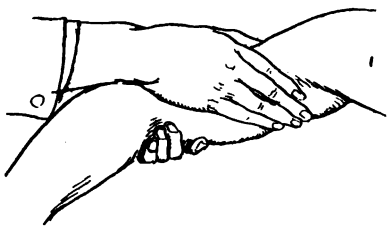

FIG. 1.—STROKING (EFFLEURAGE).

In this and the following diagrams the supporting cushion has been omitted, so as not to obstruct the view of the limbs.

blood. The fluid follows the negative pressure thus created in the blood-vessels, and becomes sucked in and pressed out. This, however, does not in any way increase the discomfort of the patient, as the actual site of the fracture is left untouched. On the contrary, by reducing the tension in the tissues, it diminishes the pain very markedly. If done skilfully, this stroking may be carried out from the very day of the injury, and should be given for about fifteen to twenty minutes, at the rate of about twenty strokings a minute, which roughly corresponds to the breathing rate of a normal person. The first few days the treatment should consist of this and nothing else; movements of the limb might easily produce a new hæmatoma.

After each application of massage the splints have to be put back into their original position. The more extensive the primary swelling was, and the bigger the

part in which the fracture occurred, the longer has this mild and expectant treatment to be carried out. Where, however, the dimensions are smaller, another point frequently arises which necessitates an early introduction of movements into the scheme. This is the importance of preserving a *good function* in places where stiffness is very likely to occur. The hands and feet, and joints in general, when directly involved into the injury, require from the beginning a more energetic treatment than a fracture through the middle of the humerus or of the femur.

The presence of *tendon-sheaths*, *joints*, and *ligaments* near a fracture calls for an *early application* of *passive movements* in addition to stroking. *Adhesions*, which in the first few days consist of fibrin alone, are thereby broken down and not allowed to become fibrous. I need hardly add that before the consolidation of fragments has taken place, all these manipulations must be carried out by the surgeon himself, and no one else. Otherwise there will be always a great danger of a displacement, which might be easily overlooked and neglected. The surgeon must be positively sure of the good position of the fragments each time he reapplies the splints. Should a slip have occurred during the daily manipulations, it is corrected without delay; and only a surgeon can decide whether the bones are in the proper position or not.

When available, the use of *X-rays* facilitates our task considerably: a radiograph taken before and after the reduction, and, if possible, during the first week or ten days, helps to disperse any doubt as to the

satisfactory progress of the case. This, however, being scarcely practicable in general practice, must necessarily become limited to rare cases presenting some particular difficulties, such as the *intra-articular fractures.*

In order to facilitate the return of venous blood, fractured limbs should be kept *elevated* during night-time, and during the best part of the day as well. The application of ice and other cooling substances, specially near the joints, is not advisable. Some authors (Championnière) go so far as to make this even responsible for subsequent chronic arthritic changes in the joints, which persist long after all the traces of the injury have disappeared.

Active movements, that is movements carried out by the patient himself, can be commenced as soon as the passive ones, that is those which are carried out by the surgeon, have become easy and painless. Active movements are, of course, begun *earlier* in fractures close to joints, such as the *ankles* or the *wrists*, but especially in such parts as the *hands* and *feet.* Movements in such cases have to be carried out as completely as possible, that is they must be performed within their widest range. It is a good method to let the patient do as much of the movement as he is able to *actively*, and then to finish off every movement *passively* until its limit is reached. This will easily help the patient to overcome the difficulties of performing active movements within their normal range, and will thus prevent the limitation of movements frequently resulting in these cases.

Cases in which a *wiring or plating operation* has been

performed, are obviously included in our considerations, because massage can and should be carried out in these cases on precisely the same lines, as long as the wound is protected from contamination by a dressing. The results of these operations are always much more brilliant when combined with mechano-therapeutic measures; all the secondary *stiffness in joints below and above the wired bone* is thus easily prevented.

Ununited fractures are equally more often benefited by this kind of treatment than not, as the slight friction exercised at both ends of the fragments against each other largely favours the formation of *callus*. The effect of it is generally seen in a week or two. This is also the reason why fractured ribs unite well, non-union in these cases being almost unknown. Here the fragments are kept moving by the respiratory movements. The same applies to most cases of fractured clavicle if there is not too much displacement.

Occasionally *rest intervals* of a few days, interposed between two courses of massage, are found useful, when the formation of callus is much retarded.

Passing now to the discussion of *individual* fractures, we shall mainly dwell upon the *commoner* types, such as are more likely to occur in general practice.

THE UPPER EXTREMITY

Although the treatment of a fractured *clavicle* does not as a rule offer any difficulty, yet the period of recovery from such an injury is often unnecessarily

prolonged by the *stiffness* of the *shoulder joint*. This is quite intelligible to us, and must always be expected after a few weeks of fixation, which is commonly practised.

Instead of this, the *arm* ought to be *moved from the first day*. The surgeon should steady the acromial fragment of the clavicle with his corresponding hand, and should carry out slow and gentle passive movements, mainly consisting of *circumduction* in the shoulder joint. The arm is firmly grasped above the elbow with the other hand.

The limb is fixed for the rest of the day by means of a strip of adhesive plaster or a bandage, following Duncan's or Wharton's method, but all these remedies are discarded after a few days, and the arm is supported by a *sling* alone. As a matter of course the strapping is taken off every day to permit of a free access to the shoulder joint, and is reapplied afterwards. If there is much swelling round about the fracture (which, of course, must be reduced if there is any appreciable amount of displacement), this has to be gently stroked on both sides of the clavicle, but the collar-bone itself must not be massaged upon. The subcutaneous position of the clavicle would render such manipulations very painful, and might, under circumstances, even injure the thin layer of soft parts covering the bony fragments. During the third week, however, gentle *kneading* or *friction* (see Fig. 7) applied by the finger-tips to the mass of callus helps to produce a firm union and alleviates the pain.

With such a programme of treatment the period

of complete recovery will in reality not last longer than three weeks, and there will be no necessity for any after-treatment.

Fractures of the *humerus* in its *upper third* would certainly yield better results, if not left to themselves for six weeks. Though the use of the triangular (Middeldorpf's) splint is recommended, it should not in any case be worn longer than a fortnight, and should be replaced by a *sling* at the end of this period or even earlier. *Massage* is commenced on the *second day* after the injury, and *within a week movements* are introduced. In carrying them out, the arm is supported by the surgeon with both his hands below and above the fracture. Even should an operation have been made necessary, considerable improvement of function is obtained by a combination of operative and mechano-therapeutic measures. Especially when the wound has healed up, movements can be carried out with more vigour, guided, of course, by careful considerations.

Massage of the *deltoid* is all-important in every case of a fracture of the humerus. The deltoid is the most important muscle of the arm we have to deal with in our work, and it has only one rival in the *quadriceps* of the leg. They both undergo a most rapid *atrophy* following a complete immobilisation of the limbs by splints, and the functional impairment resulting therefrom is often appalling. We have to do all that is in our power to preserve their strength, if we do not want quite unnecessarily to prolong the period of recovery for many weeks after the osseous union has taken place. We must substitute massage and passive

movements for the active normal movements which the patient is now unable to perform, and which kept his muscles in a fit condition up to the moment of the injury. All the arm muscles, but particularly the deltoid, should be thoroughly kneaded and hacked as well as stroked at the commencement and at the end of each daily sitting.

Kneading is done by *pinching* the muscles up between the *thumbs* and *fingers*, both hands alternately squeezing the tissues gently, and at the same time

FIG. 2.—KNEADING (PINCHING, PETRISSAGE).

moving along the belly of the muscle (Fig. 2). In addition to this, the whole of the limb may be *grasped* with both hands, and kneaded as if it were dough in a bread-pan (Fig. 3).

Hacking is done with the *ulnar borders* of the hands, and chiefly of the fingers. The little fingers alone are in direct contact with the parts treated, the other three falling down on the little fingers the moment they touch the body of the patient, thus adding to the force (Fig. 4). The hacking movements have to be

accomplished by frequent and rapid *ulnar flexion in the wrist joints alone*, the elbow joints being kept

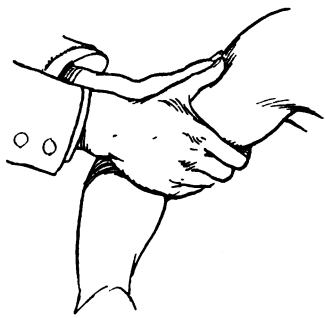

FIG. 3.—KNEADING (GRASPING).

motionless. This renders the hacking more elastic, and at the same time more penetrating, so that it exerts an influence on the deeper layers of tissues, and is less

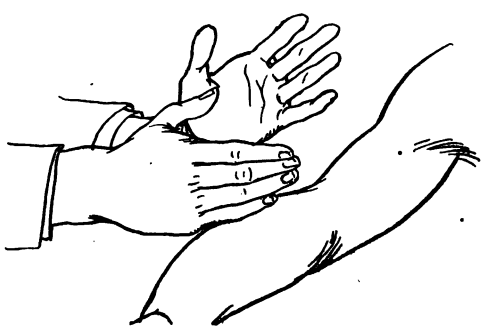

FIG. 4.—HACKING (TAPOTEMENT).

fatiguing. It is advisable to start at the insertions of the muscles in our case it will be the insertion of the deltoid—and to move upwards towards the origin

of the muscles, because in that way we empty the blood-vessels better, and thus remove the waste products more readily.

My experience with cases in which smaller portions of bones were separated, such as the *tuberosities* or the *coracoid process*, taught me, that it is of infinitely more importance to preserve the *good function* of the limb than to maintain its morphology.

The latter, though possibly an ideal we should strive after, must sometimes be disregarded in the interest of our patients, who in these cases desire but a useful limb. Therefore little attention should be paid to the character of such injuries, and their treatment should resemble that of simple sprains or dislocations, which will be discussed in a separate chapter (see Figs. 18 and 19, facing pp. 42 and 43).

Applying splints to a case of an avulsed tuberosity of the humerus would resemble killing flies with cannon-balls.

A case of an ununited fracture through the *middle of the humerus* in a man I had some time ago, may be perhaps of some interest to the reader, especially as it illustrates two points together. Though an operation was decided upon in this case, I obtained permission to apply massage first. Within a fortnight there was so much bony union that the idea of an operative intervention was abandoned. A few weeks later the patient was off the sick list, and able to do his work.

Even if one is not at all of a hostile disposition towards operative measures, one cannot help thinking that many operations of this kind are performed without sufficient

understanding of facts, which, after all, ought to be pretty obvious. According to the text-books, most cases of non-union are due to malnutrition of the limb, and therefore people have tried thyroid extract and Bier's treatment. Not in vain also have we known plating operations being performed three and four times without success; because many of these cases, if operated upon, are bound to give bad results, and to bring the operative methods into discredit, having suppuration, and finally amputation, a disappointing sequel. Interposition of soft parts is no such serious mechanical obstacle as is often imagined. It happens very frequently that the operation confirms the absence of any such hindrance, and even should this be present during the first few days, it need not remain there for months, since a great deal of it becomes absorbed in the course of a few weeks. Operative treatment of ununited fractures ought to be undertaken only after all the other methods have failed, and even then it ought to be aided by massage, which, as generally understood, helps to raise the vitality of the injured parts by eliminating waste products, and increasing the blood-supply.

The only direct indication for an immediate operation is given by the bone fragments being displaced to such an extent that this is quite incompatible with anything like a good function later on. This must, however, be confirmed by a radiograph, taken after the bloodless correction has failed. If all the operations were always carried out according to this strict indication, the results would be probably a little more satisfactory on the whole.

In the above-mentioned case a Gooch's splint was found very useful, and the patient had to wear it until the union was completed. As long as the callus was still soft, there was a great danger of a displacement, which had to be watched very carefully. Massage was given to the deltoid, the biceps, and the triceps; the shoulder was moved every day so as to prevent stiffness and atrophy of the shoulder muscles, and shrinking of the joint apparatus; the humerus was well supported above and below the fracture, whilst these evolutions were carried out.

More freedom should be given to the arm in cases of *supra-condyloid* fracture, in which there is always a considerable danger of muscular or nerve paralysis, if splints are applied too tight, and the circulation neglected. Ischæmic contracture of the hand is very common in cases where there was any pressure on the forearm.

I have got under my care a girl, who, five years ago, sustained a fracture of the lower end of the humerus, and had a splint put on. The next day she developed all the signs of Volkmann's paralysis due to defective blood-supply, resulting in an absolutely crippled hand. She was under treatment for a year and a half, and has improved so far that she can do some sewing and darning. (See *The Lancet*, May 17th, 1913, "A case of Volkmann's Ischæmic Contracture of the Hand.") (Figs. 5 and 6.)

Many of the different types of fractures of the *elbow* region can here be dealt with summarily. Experience has taught me that from the point of view of the treat-

ment and of the subsequent recovery it is to a certain extent immaterial what kind of fracture we have before us. Be it a fracture of the *lower end of the humerus*, where only a small portion of the bone has been separated; be it the *head of the radius* that suffered the break; or be it that one of the *epiphyses* of the elbow has become separated—the treatment must be carried out with the view of preventing stiffness and final limitation of movements at this joint. An exact diagnosis, confirmed by radiographic examination, is, however, very valuable, especially with regard to the prognosis and duration of treatment.

Massage must be started immediately in these cases, because the joint generally presents a very extensive *hæmarthros*. Passive movements are carried out very gently from the first, whilst the muscles of the arm (mainly the biceps and the triceps) are gently kneaded and stroked with the other hand, so as to obtain as complete a relaxation of their spasm as possible. Every day these movements are performed once or twice in each direction: pronation and supination, flexion and extension. Too much movement may favour the production of an unnecessarily great amount of callus undesirable in a joint. (This applies especially to children.) Active movements are commenced during the second to third week. Splints are better not used at all than worn too long, a sling rendering a sufficient protection, and the arm is kept well flexed the first week or two.

Fracture of the *olecranon*, if without any too great displacement of the fragments, is best treated by massage and early movements, splints being quite

FIG. 5.—CONDITION OF THE HAND BEFORE TREATMENT, FOUR YEARS AFTER THE ACCIDENT.

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FIG. 6.—CONDITION OF THE HAND EIGHT TO NINE MONTHS LATER.

unnecessary. A strip of adhesive plaster may be put round the lower third of the upper arm to prevent the upper fragment from being pulled upwards by the triceps. Should the displacement be considerable, the fully extended arm is fixed to a Gooch's splint by means of a bandage and massaged daily, movements being commenced after a week. Old-standing fractures of the olecranon are best operated upon if the function is impaired, and there is a wide gap between the fragments.

Fractures of both *ulna* and *radius*, especially in children where they are commonly of the green-stick variety, give excellent results with massage and movements applied early. Particularly important is the *extension of the fingers* carried out simultaneously with the extension of the wrist, which should be started on the first day. The reason why stress should be laid on this particular movement is the common injury of the *flexors* of the fingers caused by the fracture, and this may become noticeable only when the fingers are hyperextended. Considerable impairment of function may result in such cases if the condition is not recognised early enough. Other movements, and particularly pronation and supination (see Fig. 8) are practised during the second week. Stroking ought to accompany all these passive movements, since it reduces the muscular spasm which often interferes with a successful application of such manipulations.

Colles's fracture, being decidedly one of the commonest fractures in general, is particularly frequent in private practice. Although it only requires an

ambulatory treatment, the results are often very unsatisfactory. Here, again, pain and stiffness are the usual complaints, deformity being unfortunately also a common appearance.

In order to obtain constantly better results a complete reduction on the very day of the accident must be insisted upon in every case. Stroking of the forearm should always precede the reduction, which will thus be rendered easy in every way: it relieves pain and reduces the muscular spasm which is one of the chief obstacles to a satisfactory reduction. The forearm is then placed on an ordinary splint, which ought to reach as far as the middle of the palm. Gentle stroking and full passive flexion as well as extension of the *fingers*, the *thumb* being the most important of them all, constitute the programme for the first few days. Such early movements of the fingers are absolutely indispensable, because of the great number of *tendons* and *tendon-sheaths* passing right over the site of the fracture, and therefore directly participating in the injury. Those belonging to the thumb are most intimately connected with the fracture by being, so to say, embedded in the extravasated blood. Active movements of the fingers and passive ones of the wrist joint, particularly pronation and supination (see Fig. 8), are introduced before the end of the first week. Extension of the wrist is the only movement which should commence a little later, as it has been alleged by some authors to favour backward displacement of the lower fragment. (The same caution applies also to fractures of the *scaphoid*.) The muscles of the forearm are every

day subjected to an energetic kneading to counteract their atrophy.

By the end of ten days the splint is discarded, and

FIG. 7.—FRICTION (DEEP KNEADING).

only a sling used for another few days. Friction (deep kneading) over the fracture (Fig. 7), and active move-

FIG. 8.—PASSIVE PRONATION AND SUPINATION.

In order to carry out these two most important movements one hand must grasp the arm just above the fracture and help to rotate the wrist, whilst the other hand controls the patient's own hand.

ments against resistance may now be commenced. The amount of resistance is regulated by the surgeon, according to the strength of the patient, and ought not

to cause too much pain (Fig. 8). It is essential that patients should exercise their wrists at home as much as possible and at frequent intervals.

By the end of three to four weeks most of the patients treated in this way will be able to resume their occupations.

Some time ago I had a bad case, a labourer who sustained a *comminuted fracture of the lower end of the radius*, but who, nevertheless, four weeks after the accident, was able to start his heavy work. He was treated on precisely the same lines as all the other cases of typical Colles's fracture. Considering the great damage of the bone, and the kind of occupation of this patient, the result must be called a very satisfactory one, moreover, the length of time required being the usual.

I have repeatedly found that patients with Colles's fracture complain of an indefinite pain situated not at the broken end of the radius, but over the styloid process of the ulna, after the fracture has become firmly united. This must be due to a laceration of the ligament attached there, and ought to receive special attention as soon as it has been recognised. Deep kneading with both thumbs placed just over the radial side of the ulna, and between the two bones as well, soon relieves this pain, which often is the only cause of the patients' inability to use their hands.

Fractures of the *metacarpals* and *phalanges* are fairly abundant in general practice, and therefore must not be left without due attention being given to them. Here more than anywhere else the necessity of mechano-

therapeutic treatment is obvious, and its aims clear. If the fingers are not too badly damaged, so as to make amputation imperative, they should be treated in the following way. After the splints and dressings (if any) have been removed, the hand is placed into a basin with warm boracic lotion, and passive movements are carried out for at least twenty minutes, night and morning. During the second week the patient is encouraged to perform active movements in the bath. The third week is spent in practising flexion and extension against resistance. Even if there is no laceration of soft parts, a warm arm bath is found useful in the active exercises which the patients have to do at home. Flexion, extension, and rotation of the wrist ought to be included in the daily programme.

As soon as the skin has healed up, massage in form of centripetal stroking can be done as well. This, of course, may be commenced on the first day if there has been no external laceration, or in other words if

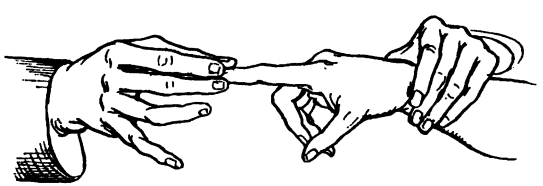

FIG. 9.—CENTRIPETAL STROKING OF FINGERS.

the fracture was a simple one. It is best done by grasping the terminal phalanx of the injured finger between the tips of one's own thumb, index, and the middle finger and moving them along, towards the knuckles (Fig. 9). This movement is often practised

by surgeons who, having put on rubber gloves, attempt to smooth out all the little folds on their fingers. Splints should in no case be worn longer than a fortnight.

Reduction of displaced fragments is indispensable in all cases, if good results are to be obtained. Fractured metacarpals receive a good support from a pad in the palm, and a closed-fist-bandage. Early movement is essential on account of the extensor tendons running across the fracture, and the possibility of their being caught by the callus. Deep friction should be applied to the inter-metacarpal spaces.

Bennett's fracture of the base of the first metacarpal does very well with the splint bearing the same great surgeon's name. Extension is indicated in almost all cases. Contiguous fingers may be used as lateral splints in cases of fractured phalanges. The sling should never be worn longer than it is absolutely necessary, as it does not the least encourage the patients to use their limb.

One point is worth remembering when practising flexion of injured fingers: the physiological limit of this movement. When the patient succeeds in bending his first (ground) phalanx to right angles with the metacarpals, one should not force him to go beyond that point in anticipation of achieving still better results, as the right angle is the limit for the majority of normal people. Any attempt to bend the fingers farther still will only cause unnecessary pain, which may easily be verified on one's own fingers.

All that has been said about the compound fractures of the fingers applies with the same strength to *all*

compound fractures, with but very slight modifications.

THE LOWER EXTREMITY

Fracture of the *neck of the femur* in children and adolescents calls for the application of massage and movements for reasons different from those which apply in the case of adults, and still more of aged people. In the first group of patients it is the good function that we want to preserve ; in the second it is the life. The value of early massage in these cases is absolutely unquestionable, and most of the text-books of a more recent date recommend such practice emphatically, advising us to induce the older patients to leave their beds within a fortnight of the injury. The reason for their doing so is by no means a trivial one. We all know the great danger of *hypostatic pneumonia* from prolonged rest in bed. Therefore we must do everything we can in order to stimulate the sluggish circulation of the older patients (see chapter on pulmonary troubles). Besides the general applications, however, the leg must receive full attention. It should be massaged from the toes right up to the groin, and upwards stroking, kneading, and hacking of the *calf and thigh muscles* should be carried out every day. Movements of the foot and knee (if possible) should be given in every case as well. If not impacted the fracture is put up in some kind of splint, preferably Hodgen's, because this permits of an easy access to the limb.

Extreme abduction is maintained all the time, and

eversion is to be prevented. Impacted fracture of the neck in middle-aged persons should be undone if the shortening exceeds one inch; if not, it should be disregarded, and the patient allowed to carry out active movements after a fortnight had passed since the occurrence of the injury. He should get up after three weeks, and use his leg in walking. If the impaction had to be undone on account of a considerable shortening, a delay must necessarily take place with regard to the union, as well as in the free use of the limb. In these cases it is wiser to re-apply the splint for the night, the leg being well abducted, until a complete bony union has been established between the neck and the shaft of the femur. This would counteract the natural tendency of the soft bone to produce a traumatic *coxa vara*.

Fracture through the *middle of the thigh* is treated on much the same principles. Particular care must be taken to preserve the strength of the *quadriceps muscle* in the same way as was described in connection with the deltoid in fractures of the arm. In stroking up the thigh, one ought to lift one's hand up when approaching the point of the fracture, in order to avoid unnecessary pain. Passive movements and massage of the *knee* are of great importance if one wants to avoid stiffness of the whole leg for many months afterwards. The reason for this is, that an effusion into the knee joint very frequently accompanies fractures of the thigh.

It is best to put up the leg in full abduction, the foot being absolutely vertical to the surface of the bed. Bed-clothes must not touch the toes, but should be

placed over a wire cage ; otherwise they will invariably tend to evert the foot. Any linear or angular displacement is corrected at once, the leg being measured from time to time.

Within three weeks from the day of the injury all movements should be freely practised : flexion, extension, abduction, adduction, and rotation in the hip joint. Within four weeks the patient is allowed to get up and to walk on crutches, which are discarded in a week or so, and he ought to be able to use his leg normally six to eight weeks after the original injury.

In children, massage is employed with equally good results. Here the suspension of the leg permits of an easy access to the thigh.

Of great interest is the fracture of the *patella*. Although the idea that good results can only be obtained by operative measures seems to be prevalent amongst the profession, yet there are certain points which often necessitate the adoption of another mode of treatment in some cases. There is, first of all, a certain number of patients who for some reason or other do not want to give their consent to an operation which is not of the life-saving type. Then, there is the risk of a secondary suppuration. However aseptically or antiseptically the operation may be carried out, the mere presence of a foreign body in the synovial cavity will attract micro-organisms circulating in the blood. Silver wire shares in this respect the fate of deep silk stitches. It is a well-known fact that even an ordinary knock—hardly deserving the name of a trauma—is often responsible for the origin of a serious condition, such

as osteo-myelitis, although no interruption of the continuity of the skin had taken place. I saw once a case of a wired patella which had gone septic six weeks after the operation, and long after the wound had healed up completely; the empyema of the knee joint that ensued remained uncontrollable for several months.

An alternative to the wiring operation is *strapping*. Strips of adhesive plaster, about ten inches long, are applied to the knee, alternately above and below the knee-cap, in such a manner that the fragments are brought close together. There are about four straps fixed below and four above, their ends overlapping.

FIG. 10.—STROKING (EFFLEURAGE) OF THIGH

Note the position of the left hand, which in this case steadies the upper fragment of the patella.

Massage of the *quadriceps* is taken up at once, but upwards stroking is carried out very gently in order not to pull the fragments asunder, and for this reason also the upper fragment of the patella is steadied by the other hand (Fig. 10). Kneading and hacking, however, is done very energetically, as it is surprising how quickly and to what an extent the quadriceps

muscle undergoes atrophy if not properly treated. The calf muscles and the foot, of course, are included. It is of utmost importance to move the fragments of the knee-cap to and fro, so as to prevent their becoming

FIG. 11.—MOBILISATION OF THE PATELLA.

adherent to the articular surface of the femur, since this is often found to be the main reason of a subsequent functional impairment of the joint. Fragments naturally are moved as one whole, and not separately (Fig. 11).

During the second week gentle passive movements, such as bending and stretching of the knee, are commenced, as well as friction around the joint. The third week is occupied with active movements of the leg in the hip, knee, and ankle joints, walking with a stick being also allowed.

One of my cases, an elderly gentleman, was confined to bed for five weeks before I saw him. Extension had been applied to the leg all the time, and the patient

not allowed to get up. The leg was in consequence wasted *ad maximum*, and the mental condition of the patient was that of great worry and distress. He thought he would never get better. However, within three weeks he was able to attend at his office in the City, and on his way home he managed to walk up a pretty steep hill in Hampstead. He was treated on precisely the same lines as described above. I may add that in his case an operation was refused on account of the patient's age and his great nervousness. Two months later the leg was still in good condition. It would have probably taken much less time if there had not been such a long period of immobilisation. Many adhesions had to be broken down which might have been so easily prevented by a few early movements.

Fractures of the *tibia* and *fibula* can be briefly dealt with. It is of importance that the extensors and flexors of the foot and toes should not become wasted. The patient should, therefore, be encouraged to move his *toes* from the first day, in spite of slight discomfort. If there has been any effusion into the *ankle joint*, a bad stiffness of the foot may result, and for this reason movements should be carried out in that joint as soon as possible. Massage is applied to the whole leg in the same manner as was described in connection with other fractures. To facilitate movements of the foot the leg is supported by one hand placed under the knee, which is kept slightly bent, the foot gently resting on its heel (Fig. 12).

The fact that the fractures of the leg are very frequently *compound* does not much influence our views

with regard to their treatment. The external wound is protected by a dressing, and carefully avoided during the administration of massage. If there have been no

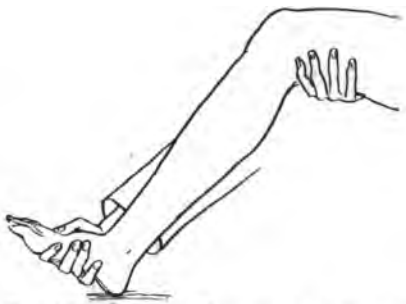

FIG. 12.—PASSIVE MOBILISATION OF THE FOOT IN FRACTURES OF THE LEG.

signs of sepsis during the first few days after the injury, no danger can arise from such practice afterwards.

Six weeks ought to be the maximum time necessary for complete recovery from a double fracture of the leg, and I have actually seen cases taken off the sick-list at the end of this period. Fractures of either tibia or fibula *alone* require considerably less time (Figs. 13 and 14). The use of a removable plaster of-Paris case (Croft's splint) is commendable, as it permits of both early massage and early walking long before the bone has become completely united. The callus remains soft and pliable for about five weeks after the injury, so that any slight displacement can be easily corrected.

Some time back I had a case in which I could give the bones any shape I liked up to the sixth week; a small weight on a pulley did in a few hours all that

was necessary. It should be remembered that the normal leg has a slight outward curve which, if possible, ought to be preserved.

The next common fracture of the lower extremity is

FIG. 13.—THE SAME CASE AS FIG. 14, FOUR WEEKS AFTER THE ACCIDENT.

The whole weight of the patient's body is put on the toes of the injured side. There is no pain on walking whatever.

Pott's fracture. This is probably the kind of fracture that generally gives the worst results. Almost every day we meet cases that have been unable to follow any kind of occupation for months and months.

FIG. 14.—FRACTURE OF TIBIA (BOY OF 11). SEE FIG. 13.

I have to think of a chauffeur whom I saw recently, and who could not put his foot on the brake for several months. Though there was a perfect bony union, so much pain was evolved through the slightest pressure that the patient had to undergo a long course of massage before he could resume his responsible work.

Next to the pain, and just as intractable, is the colossal *œdema* that nearly always accompanies bad Pott's fractures. This can only be explained by a very defective circulation, partly caused by swelling of the joints in the first few days after the injury, but greatly due to a diminished tonus of the blood-vessels as the result of muscular inactivity. Both stasis and pain can be prevented if massage and movements are commenced immediately after the injury.

No matter what type of fractured ankle we have before us, whether it be the classical Pott, inverted Pott, or Dupuytren, the chief point is the same in all cases, namely effusion into the ankle joint as well as into its vicinity, and therefore they all have to be treated in a similar fashion. After the displacement has been duly corrected, massage of the swollen joint should be applied without delay. The right foot is placed on the surgeon's left knee, leaving the heel free. The surgeon places his right thumb behind the internal, the rest of his fingers behind the external malleoli, thus in a way embracing the Achilles tendon, and carries out stroking movements in the centripetal direction alone (Fig. 15). The surgeon's left hand steadies the foot by holding it across the instep. (The left foot is treated in the reverse way.) The hand being now pronated,

the dorsum of the foot is massaged likewise, also the calf has to be stroked and kneaded. The gentlest possible movements ought to be applied in the beginning, as the pain is generally very intense.

Within three days the swelling will have subsided so far as to permit passive movements, and flexion and extension, adduction and inversion, are those to be practised first. Abduction and eversion need not be encouraged, since they are apt to favour displacement

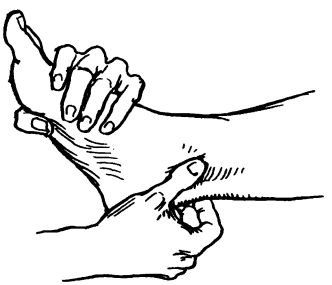

FIG. 15.—MASSAGE OF THE ANKLES.

so characteristic in fractures of the ankle, which leads to the deformity known as traumatic *flat foot*.

In order to carry out passive movements, one hand steadies the leg above the ankle, and the other holds the foot, preferably placing the thumb on the dorsum, and the other fingers on the sole of the foot. Active movements of the same kind, with similar exceptions, are begun during the second week. Special stress should be laid on good *adduction* and *inversion*, so as to maintain a good arch of the foot, and to strengthen

the tibial muscles. Plaster-of-Paris splints, though very practical with regard to early walking, are not advisable, as they do not permit of any movements and massage, unless they are made removable. If neglected, the muscles are bound to become atrophied and weakened. Kneading of the ankle region, with finger-tips directed towards the ends of both malleoli, will stimulate the formation of callus, and disperse the œdema ; the latter will also improve considerably if the foot be kept *elevated* during the night.

Splints should not be applied longer than ten days, after which period the patient is allowed to get up, but not to put his foot to the ground. Walking is commenced only when there is no more danger of the foot being displaced outwards, and this would not be safe

FIG. 16.—TIP-TOEING.

before the fourth week, especially in heavy people. Patients must be reminded that once they start walking, they should place their feet *parallel* to one another.

Exercises against resistance (adduction and inversion, flexion and extension) should be persevered with for

another fortnight. Tip-toeing with the feet inverted (Fig. 16) should be practised by the patient himself every morning for another month or longer. It will be found that the results of Pott's fracture will be much more satisfactory if treated in the above manner, and will not disable the patient for longer than six weeks.

A special point to be observed during treatment is the finding out of *tender areas* in the neighbourhood of the fractures. Some of them are more constant than others. There is, for instance, nearly always an excruciating pain elicited by pressure right in the middle of the calf, between the heads of the gastrocnemii, probably due to a hæmatoma close to one of the bigger nerves. Also the parts along the Achilles tendon are frequently found to be tender, which is most likely caused by an extravasation of blood in the sheath of this tendon. Other spots are scattered all over the leg, often situated between the extensor muscles. Deep kneading relieves pain so rapidly, that tenderness often disappears completely within a day or two.

As a parallel to the case of the chauffeur, I might quote that of a pianist of over seventy, whom I treated quite recently. Five weeks after the injury this patient walked without any support whatever, and could bend his knees whilst standing on tip-toe. No trace of pain or œdema, no limitation of movements, no displacement in spite of a *treble* fracture. Two fragments of the tibia, and one of the fibula, were chipped off the lower ends, as confirmed by the radiograph (Fig. 17). The age of the patient had not the slightest effect on the length of the time required for his recovery.

Complete reduction of the fracture on the first day under an anæsthetic, and an *early application of mechano-therapeutics*, are the only factors responsible for the difference between these two cases.

Fractured *metatarsals* require considerably less time,

FIG. 17.—TREBLE FRACTURE OF THE ANKLE.

since they do not upset the mechanism of the foot so much as Pott's fractures do: the architecture of the foot is maintained by the other metatarsals in spite of one of them being broken. Massage of the foot, which consists, besides stroking, also of kneading with both thumbs placed on the dorsum, and the fingers on the

sole will soon establish normal circulatory conditions. Exercises include tip-toeing and transverse bending of the foot, along an imaginary line, running parallel to the metatarsals. Walking will thus be made possible during the third week.

Fractured *toes* are treated exactly like fractures of the fingers, as described above.

In concluding this chapter I must add a word on the *objections* that have been raised with regard to massage and movements in fractures.

The formation of *excessive callus* had been *alleged* to be one of the consequences of early massage. It is a fact that massage does favour formation of callus, and for this reason we apply it in cases of ununited fractures. But, personally, I have not seen one single case in which the just-mentioned complication should have occurred. Evidently, those cases in which an abnormal amount of callus thrown out caused an impairment of function were either cases of what is called "exuberant callus," which happens even in fractures treated by the old methods of prolonged immobilisation, or the massage was applied incorrectly, to say the least.

I dare say the majority of those whose views on the latest management of fractures are sceptic, have never carried out massage themselves, and judge only by the results of some third person's work, or they would have undoubtedly come to a different issue.

It has also been *alleged* that *pulmonary embolism* was a much feared complication of massage; this, however, is absolutely denied by men of such wide experience in fractures as Sir William Bennett.

There is one more point I want to draw the readers' attention to, and that is the *psychic influence* of our treatment on the patient. It helps the patient to overcome his timidity of using the injured limb more gradually, and it gives him more confidence, through his being able to watch the daily progress of his case.

B. SPRAINED JOINTS AND DISLOCATIONS

The treatment of what is popularly called *sprains* does not differ essentially from the treatment of fractures. There are, however, two points to remember. Firstly: *no sprains should ever be put up in splints;* and secondly: *active movements* should be commenced on the *first day*, besides the usual employment of massage. If both these points will be adhered to, the period of recovery will be considerably shorter than it is in cases in which splints and a long rest are prescribed. By immobilisation of ordinary sprains we only lose time, and miss the chance of preventing the formation of adhesions. It is always a risky thing to leave a hæmatoma alone there, where good function is particularly desirable.

Everybody who has attended post-mortem examinations, and has had to remove the lungs himself, knows to what an extent adhesions can form in serous cavities; and he will realise that if such firm bands and strings can originate in the thorax, despite the respiratory movements, how infinitely more likelihood of their formation there must be in such serous cavities as the immobilised joints.

I remember hearing once a colleague relate about his experience of the two different methods as applied to himself. He once sprained one of his ankles whilst skiing in the Alps, and the Swiss doctor who was called in, immediately started massaging the sprain. A few days after he resumed his sport. Some three years later he sprained the other ankle, playing football in England, but this time he was, unfortunately, put to bed for six weeks, and the result was that he was unable to use his foot for three months. This is precisely what happens in our work almost every day.

Of great importance in these cases is the right diagnosis: if there be any suspicion of a fracture, the sprain would be better treated as a fracture; but, with the X-rays becoming more and more popular, a radiograph can be easily obtained after the injury, and this will decide one way or the other.

In *dislocations*, which differ from sprains only in the degree of damage done to the joint apparatus, greater care should be exercised with regard to the active movements than need be done in simple sprains. Those movements which caused the dislocation would in the beginning favour its recurrence, and should therefore be avoided, until all the signs of the injury, such as swelling and discoloration, have disappeared, and all the other movements can be practised with complete ease.

One of the commonest examples of this type of injuries is a sprained *shoulder* joint, which requires the following treatment. Stroking and kneading of the deltoid towards the trunk, as well as stroking of the whole arm right up to the axilla, is carried out with the

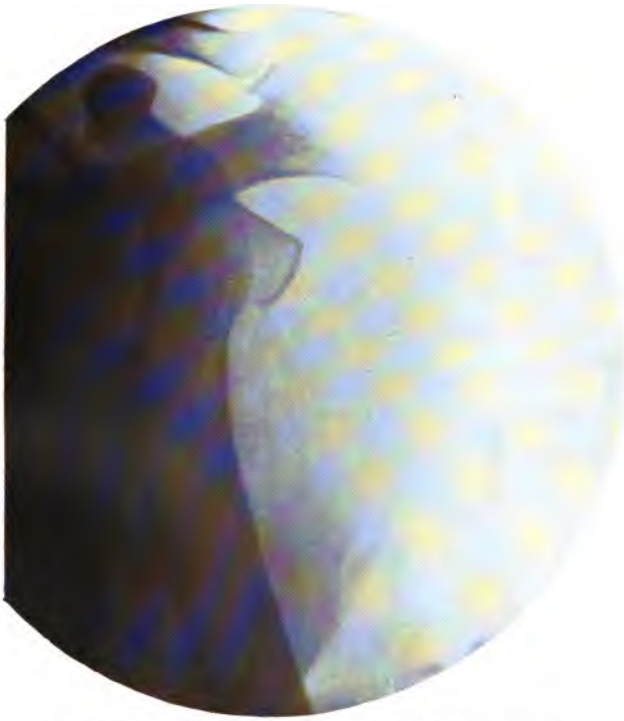

FIG. 18.—A CASE OF SUBCORACOID DISLOCATION OF THE SHOULDER COMPLICATED BY A FRACTURE OF THE TUBEROSITIES.

Before reduction.

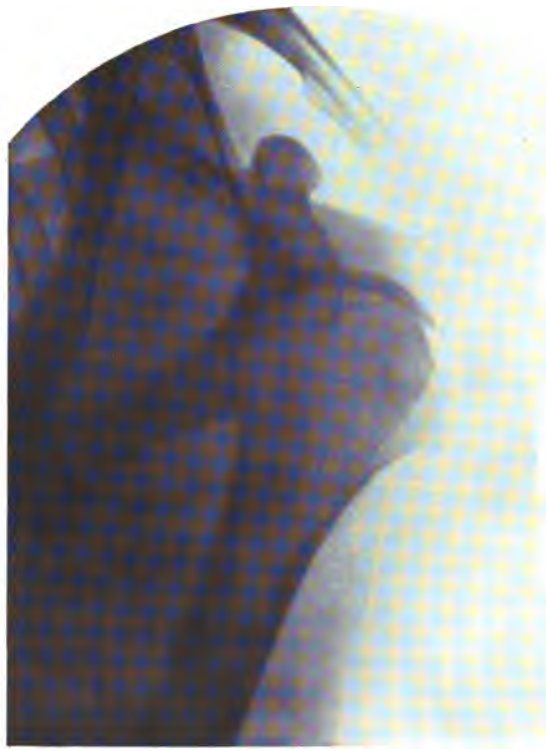

FIG. 19.—THE SAME CASE AS FIG. 18, AFTER REDUCTION, ALSO SHOWING THE FRACTURE.

This patient, a male typist of about 30, was discharged five weeks after the accident, completely cured.

object of preventing atrophy of the muscles. Gradual rotation of the humerus outwards, until the hand can be easily put on the back, and inwards, until the elbow can be placed on the middle of the chest, prevents the formation of such adhesions which might produce a limitation of these two very important movements. In a case of a simple sprain, the abduction of the arm must be insisted upon from the first, but this exercise must be very moderate in cases of *subcoracoid dislocation*, because an extreme abduction would each time force the head of the humerus through the rent in the joint capsule, and thus favour the establishment of "habitual dislocation."

The sling should not be worn longer than three days, its object being only to take the weight of the arm off the shoulder joint capsule and ligaments, until the effusion has begun to abate, which generally happens within two to three days. All the movements should be practised so long, until the patient himself has learned to perform them within their full range, and without experiencing any pain whatever. Should some stiffness of the joint persist in spite of that, this can easily be remedied by friction of the joint capsule at places where it is accessible to the fingers. The treatment can advantageously be given twice daily (Figs. 18 and 19).

In sprains of the *elbow* and of the *wrist*, great stress should be laid on good pronation and supination, as these two movements are usually impaired. Massage is given in the usual way, consisting of stroking and friction, which is chiefly applied to the radio-humeral

articulation in the elbow, and to the styloid processes in the wrist.

Sprains of the *hip* joint are less easily influenced by direct manipulations, the joint being only accessible in front. Movements should, therefore, be encouraged in all directions: flexion, rotation, abduction, adduction (by crossing the legs), and extension are done first passively, then actively, and finally against resistance.

In *iliac* dislocation adduction is to be avoided; abduction being restricted in *pubic* dislocation.

The leg should always be carefully measured in these cases, this being especially important then, when a radiograph cannot be obtained.

Most common are the sprains of the *knee* joint. Sport and football *par excellence*, play a prominent rôle in the history of injured knees. Putting aside cases of displaced or fractured semi-lunar cartilages which, unless operated on first, are not suitable for mechano-therapeutic treatment, there still remains a large number of cases which are greatly benefited by mobilisation and massage. The knee joint is readily accessible, especially when distended by fluid. The parts which may be directly attacked are the upper synovial pouch above the patella, and the two recesses to both sides of the knee cap, bulging out when fluid is present.

The surgeon places his hand almost flat over the swelling, and gently presses it upwards, continuing the movement as far as the groin, and repeating this for at least twenty minutes. Absorption of the fluid takes place very rapidly, so that passive bending and stretch-

ing of the leg can in most cases be commenced on the next day, and on the third day the patient is told to do it himself, being only aided by the surgeon. In most cases there should be no difficulty in walking within two or three weeks. Strapping or bandaging and still less splinting of the joint is hardly ever indicated. If some tender area be revealed in the course of treatment—as it sometimes is the case on the inner aspect of the knee or below the patella—they should be rubbed and kneaded. Flexion should be carried out in such a manner as to reach as soon as possible its physiological limit, which can be tested by comparing the injured limb with the normal one, whilst the patient is lying on his face.

Sprained *ankle* is undoubtedly the most common injury of a joint met with amongst all classes of people. It is sometimes very difficult to differentiate it from a Pott's fracture, a useful guide in that respect being the exact localisation of pain. In Pott's fracture the greatest tenderness is experienced just over the tip of the malleolus, that is over the site of the fracture. In a sprained ankle the pain is most intense lower down, where the ligaments have been ruptured; an extensive swelling, however, may obscure the anatomical picture so as to make this test impossible. Then, of course, crepitus, deformity (mostly outward displacement of the foot), and finally a skiagraph, will help to establish the right diagnosis. If an X-ray picture is not obtainable, and doubt exists whether the case be a simple sprain or a fracture, the case should be regarded as a fracture, and treated on the lines indicated above.

Ordinary distortions of the ankle must under no circumstances be immobilised. The only result of complete and prolonged rest will be the formation of adhesions in the joint, as well as in the surrounding tendon-sheaths, the last practically always participating in the general effusion. Massage is given once or twice a day, lasting each time fifteen to twenty minutes, and movements are begun on the first day, being quickly though gradually increased in range. Flexion and extension of the foot have to be practised by the patient himself, being particularly important.

Massage ought to be soothing, not painful. The swollen parts should be gently stroked upwards, including the calf, right up to the popliteal space. A more detailed description of how massage should be done in these cases was given under Pott's fracture. Walking is allowed on the third day, cycling and every other kind of exercise being encouraged.

There is one point which ought to be remembered in connection with the treatment of fractures and sprains of the lower extremity, and this is *limping*. Experience has taught me, and, no doubt, the majority of the profession will agree, that limping is in most cases an outcome of the patient's timidity in using the injured leg. This, though fully justified in the beginning of the treatment, soon grows a habit difficult to eradicate, and therefore it should be early counteracted by repeatedly drawing the patient's attention to the fact, that there is nothing to account for the limping.

C. CHRONIC ARTHRITIC CONDITIONS

Cases of *osteo-arthritis* are generally benefited by graduated exercises, if the extent of the trouble does not render them too hopeless. The progress is, in most cases, a very slow one, improvement being noticeable only after some months of treatment. It is the general health that ought to receive special attention, and not the condition of the limbs alone. More detail on this subject will be found lower down, where *constitutional diseases* will be dealt with, since, in all possibility, osteo-arthritis has to be counted amongst them.

The prognosis is much better in patients who suffer from articular stiffness and pain, following *injuries*, such as intra- and peri-articular fractures, dislocations, and sprains, when they were not properly treated at the time being (*traumatic synovitis*). Most of them have *adhesions* caused by prolonged immobilisation and want of exercises. If the surgeon is unable to break them down by means of ordinary passive manipulations, he has to effect it under general anæsthesia, which is followed by a course of massage and active exercises, necessary to strengthen the muscles, often highly atrophied. In order to render the result of such an operation really satisfactory, the surgeon must not forget any movements possible in the joint, under normal conditions, and moreover he should carry them out within their fullest range under an anæsthetic. Cases are often met with where, for instance, only *one* particular movement of the arm is found to be painful, and only when the patient attempts to reach for some

object, which requires a complete action of the joint, such as buttoning up braces on the back, combing the hair on the back of the head, putting on boots, or taking a book off the shelf, and the like. The presence of adhesions as a possible cause of such symptoms ought always to be borne in mind, when considering the treatment of cases with a definite history of a trauma.

Operations of the kind described must be performed with a light, yet a steady hand. The amount of force to be applied can never be estimated beforehand, but it ought to be just sufficient to sever the adhesions without injuring the joint apparatus. The best method of doing it is that of slight jerks, the amplitude of which is gradually and speedily increased. This simple procedure, under the name of "bone-setting," is practised by many quacks, and constitutes the alpha and omega of their skill.

Similar treatment is applied in cases of *teno-synovitis*, which often results in bad stiffness, unless appropriate steps have been taken at the right moment. Massage and movements are to be commenced as soon as the acute stage of teno-synovitis has abated. Should incisions have been made, it is wiser not to wait with the mobilisation until the wound has healed up completely, but to carry out movements in a warm antiseptic arm bath, such as boracic lotion, *a few days* after the operation.

D. INJURIES TO SOFT PARTS

Contusions of soft parts, popularly called *bruises*, require immediate treatment by massage. Rest and

lotions have become quite obsolete. It is quite obvious that besides numbing the pain for a moment, they cannot have any lasting effect whatever. *Adhesions* which result from serous or hæmorrhagic effusions taking place between muscular fibres, are just as injurious to the function of a muscle as they are in a joint or a tendon-sheath to the function of these structures. It is a well-known fact that the increase of fibrous tissue in a muscle impairs its contractility and thus reduces its strength. Another fact about scars is that, undergoing a certain amount of contraction, they are likely to entangle nerve filaments. This constant pressure and dragging on the nerves is the cause of the *dull pain* which so frequently persists after injuries of soft parts.

Massage is carried out on the first day as painlessly as possible, and is given with the object of dispersing the extravasated blood or serum, and thus preventing adhesions. The swelling need not become smaller at once, though the discomfort of the patient may be greatly reduced after the first application. It is a good practice to commence massage with stroking of the parts above the bruise, then gradually to encroach upon the swelling, and finally to massage the parts beyond it. Free exercises should be encouraged from the first, and should be particularly insisted upon if the injured parts are situated *near a joint cavity*, or if the *tendon-sheaths* are involved in the injury.

The above method is equally applicable to *contusions of the skin* and subcutaneous tissues as well as to *contusions of the periosteum* itself: in cases of a hæma-

toma of the periosteum, the formation of *traumatic nodes* is thus prevented. The pain caused by the pressure of the effusion which raises the periosteum off the bone, is often very intense, but it is greatly alleviated by massage, which also considerably hastens the absorption of the fluid.

If a *sprain* has been caused by an over-straining of a muscle at sport or at work, that particular movement which caused the injury is to be avoided for a few days. There is a long list of complaints, known under various names derived either from different kinds of sport, or from occupations in which they occur, such as "sculler's sprain," the "golfer's back," etc. Massage, first stroking and kneading, then hacking and gentle exercises, constitute the treatment of these cases.

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E. CHRONIC INFLAMMATORY CONDITIONS OF SOFT PARTS

The first place in this group—as far as frequency of occurrence is concerned—must be given to the condition popularly known under the name of *muscular rheumatism*, which, however, some call *fibrositis*.

Though the nature of this widespread complaint is still somewhat obscure, its treatment appears to be well defined at present. Patients generally complain of *dull pain* at one or more places of their body, the trunk and upper arm being chiefly involved. Exacerbations of pain described as being similar to the pain experienced after a bad bruise coincide with certain atmospheric changes, such as damp or windy weather.

The parts thus affected feel heavy, and if, for instance, the arm be the seat of the trouble, the patient may become unable to use it at all. Some movements are particularly painful, such as lifting the arm sideways, or upwards, as in combing hair or pouring out tea. There is generally a long history of many similar attacks, usually called by the patients attacks of rheumatism or neuralgia, the pain being often fallaciously referred to the nearest joint, most frequently to the elbow and the shoulder joints.

Clinically, on examination, one finds that the pain can nearly always be localised. In the case of pain in the shoulder, the greatest tenderness is elicited by

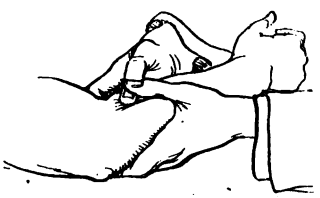

FIG. 20.—FORCIBLE KNEADING OF THE ELBOW REGION.
Note the position of the thumbs.

pressure on some parts of the deltoid. Should pain in the elbow be complained of, the tendon of the triceps or the supinators are found to be tender. The movements in these joints are quite painless when carried out passively by the surgeon. Very careful examination by well-trained hands reveals areas which feel slightly firmer than healthy muscular tissue does. If, however, great pressure is applied to them, which can be done by placing both thumbs one on top of the

other (Fig. 20), these areas pit, like an old chronic œdema. The pain is only bad at the commencement of pressure, but is generally relieved a few moments after.

Pathologically, little change can be found to explain the comparatively well-marked clinical disturbances. Serous, sometimes cellular, *infiltrations* of muscles have been described as the only findings in these cases. The pain must therefore be attributed to pressure on nerve endings, caused by serous exudation. If after a time a certain amount of *fibrosis* takes place, the complaint becomes still more tedious, and hard nodules may then be felt along the muscles, fasciæ, and tendons, likened by some authors to rows of beads. They are often encountered in the cervical region in the trapezii and the sterno-mastoids. Situated near the exit of the occipital nerves, they give rise to *occipital headache* (see chapter on headache, under Neuralgia).

Torticollis is often produced in the same way through an irritation of the spinal accessory nerve.

Lumbago may persist as long as the lumbar nerves are pressed upon by the infiltrations occurring in the quadratus lumborum.

Sciatica is just as frequently caused by the same kind of changes in the glutæi, which, however, is a fact not often recognised.

All cases of fibrositis are greatly benefited by a course of massage, which should consist of a very vigorous kneading of the parts affected. Deep and forcible pressure should be exercised on the infiltrated areas in order to bring about the absorption of the inflammatory

products. This is best done by grasping the limb with both hands, and placing both thumbs on the painful spot. In these cases it is advisable to use an electric vibrator, with a small rubber applicator, as manual treatment may become rather fatiguing, especially if different parts require similar treatment. Hacking and stroking are here useful adjuvants, and help the circulation to eliminate the waste products. As the surrounding muscles are more or less weakened through the patient not using them properly on account of pain—exercises in all directions should be encouraged. Slight exacerbations of pain are not uncommon in the beginning of the treatment, which has to be applied daily, during four to six weeks on an average. Some patients find also the application of heat very soothing, such as hot poultices or radiant heat. Others, however, cannot bear it at all.

Massage has unfortunately been seldom adopted in *ulcers*. Chronic ulcers, resulting, or favoured by a torpid circulation, as in the case of *varicose veins*, or originating from *traumatic* and *thermic* causes in anæmic subjects,[1] are all cases which obviously require stimulation of the parts thus affected. If we succeed in relieving the venous stasis, we necessarily benefit the ulcer, as in that way we influence the nutrition of tissues. The affected limb—which is in most cases the lower extremity—should to this effect be kept elevated during the best part of the day and the night. The vicinity of the ulcer, which is always very painful,

[1] To this class the complaint known under the name of *Raynaud's disease* belongs.

—especially the parts beyond it—is gently stroked towards the trunk of the patient, thus emptying all the veins and lymphatics.

To rub the ulcer itself, though advocated by some authors, is not commended on account of the great tenderness, and the risk of destroying the granulations. This may, however, be tried as a preliminary step carried out once in the beginning of the treatment, as an alternative to scraping or curetting. In such a case the surface of the sore is covered with a piece of boracic lint, and the thumbs are placed on top of it.

The prevention of *bed-sores* is so important that it need hardly be emphasised. It should become a routine measure that in all cases of long illness the prominent points, such as the scapulæ, sacrum, and the heels, should be inspected every day, and long before any signs of sores appear, these parts should be submitted to a daily friction with such stimulants as methylated, or pure spirits of wine. The general application of mechano-therapeutics in such cases will be considered later, when the treatment of debility is discussed.

There is one more trouble belonging to the inflammatory conditions of soft parts to be mentioned, and this is *catarrhal prostatitis*, one of the most troublesome complaints known. It is very little influenced by the ordinary methods, and it runs a very chronic course. It thus becomes most tedious to both the surgeon and the patient. The latter becomes affected physically, as well as psychically, if the *prostatorrœa* is not radically attacked by means of rectal massage.

The patient is placed in the knee-elbow position. The index finger, protected by a rubber finger-stall, and lubricated with some indifferent ointment, is introduced into the rectum. The prostate in these cases is generally found to be enlarged and granulated. The treatment consists of gentle stroking manipulations in a downward and forward direction, and is carried out with the pulpy part of the finger, so as not to injure the rectal mucous membrane. This is carried out once or twice a week, and it is followed by an immediate improvement. After each sitting, a considerable amount of thick milky fluid escapes from the urethra. Within a few weeks of regular treatment the size of the prostate is found diminished, and the amount of discharge considerably lessened, or completely arrested. Massage acts here as a stimulant to the glandular tissue by emptying its secretion and supplying it with fresh blood instead. This can hardly be achieved by any other means, owing to the inaccessible situation of this gland.

F. DEFORMITIES

The deformity most frequently observed in general practice is *scoliosis*. Probably a hundred per cent. more cases would come under observation if every young subject complaining of *pain in the back* and *general weakness* were stripped at the first consultation, and thoroughly examined. If this routine measure were carried out conscientiously by every medical man in the country, the incurable hunchbacks would disappear

in less than a quarter of a century. Ninety-nine per cent. of all curvatures could be prevented or cured, if attacked early, before gross bony changes had taken place. The *age of eight to twelve* is most commonly the time when the trouble *begins*, many *more girls* being affected *than boys*. Their relation varies between 5·1, and 9·1 (see the author's "Spinal Deformity in Schoolgirls," *School Hygiene*, February 1914).

It would go far beyond the scope of this book to discuss the various theories of the formation of spinal curvatures. Our object here is only to state how far, and in what way, mechano-therapy in general practice is applicable to these cases, and what good it may be expected to do.

Assuming that scoliosis nearly always, and in the first place, is due to weakness of the whole frame or its parts, such as bones, muscles, and ligaments, other factors, such as weight and faulty position, playing only a subaltern rôle, all our efforts must be directed towards the *strengthening of the spinal apparatus*.

We have three ways of doing this by mechanical means: *exercises*, *massage*, and *appliances*. These factors should never be used separately, though the last-named one may often be left off altogether; their combination, however, depends on the kind of the case under treatment. Slight cases, with little deformity and little subjective symptoms, such as pain or fatigue, do well with exercises given mainly, massage being used as an adjuvant. Those cases in which subjective complaints are predominant require chiefly massage, exercises being administered very cautiously.

Very advanced cases, with a great amount of deformity, pain, and respiratory and circulatory disturbances, obtain considerable relief from supportive jackets, worn during the daytime. Massage is employed here as in all other cases, and exercises, mostly passive ones, are directed towards improving the circulation, as well as respiration.

Massage of the back consists of stroking, kneading, and hacking. Stroking movements are carried out in three stages: along the upper part of the trapezius, from the back of the neck towards the shoulders; along the lower part of the same muscle from the shoulders towards the loins; and finally along the latissimus dorsi from the axilla down to the iliac crests. Both

FIG. 21.—KNEADING OF THE TRAPEZIUS.

hands are employed at the same time, each of them massaging the corresponding side. Kneading is done by placing the hands flat on the patient's back, and moving the skin over the muscles; the hands are not moved over the skin, as is the case in stroking. The upper part of the trapezius being accessible to the

fingers is pinched up, and kneaded in the ordinary way (Fig. 21). Hacking is very useful as a means of stimulating the erectores spinæ, and is best carried out transversely to the course of these muscles.

It is necessary to devote at least five minutes to these manipulations each time. In cases where massage chiefly is indicated, these sittings should, of course, last longer, fifteen to twenty minutes being an average. The patient lies on a couch, his back being exposed; the person administering massage is standing or sitting by, facing the upper part of the patient's body. When combined with exercises, massage is given during the *rest pauses*, which must necessarily be made in these cases.

With regard to *exercises* we may point out that their object is a threefold one. Firstly, loosening of ligaments and stretching of the shortened muscles on the concave side of the deformity. Secondly, correcting the deformity itself. Thirdly, teaching the patient what the normal position of his spine ought to be, and how to maintain it.

It would be almost impossible to give a complete list of exercises to be practised by scoliotic patients, but it may be accepted as a general rule that any movement of the body, no matter whether a passive or an active one, tending to undo the curve, is of value, and may be used as an exercise.

Movements are often combined with different *attitudes* of the body, and more complicated movements may be constructed out of two or three simple ones, thus offering us an unlimited variety to choose from.

Out of this large number we select a few exercises especially suited for the particular case under treatment, and we carry them out every day, increasing their amount gradually. They all must be performed slowly, the fullest attention of the patient and the surgeon being concentrated on them all the time. They should be carried out within their widest range, that is to say as far as the anatomical barriers permit. The number of times each movement should be practised varies so much in every case according to the amount of energy possessed or spent on other exercises, that it cannot be fixed beforehand. We generally begin with six, and increase the number up to twelve, but there is no reason why certain patients should not perform twice as many.

There is only one factor that must be punctiliously observed, and that is *fatigue*. The moment we notice that the patient fails to carry out the movements with his usual alacrity and precision, the exercises must be interrupted, and a rest period of five minutes interposed, during which massage is employed. Some of the commoner signs of fatigue are swaying of the body, or changes of the rhythm with which the exercises are usually practised: patients first hurry, and then slow down and tumble. Another sign of fatigue is a faulty respiration, which ought to be closely observed throughout the treatment. The expression of the patient's face should be carefully watched, as it often indicates the moment of his exhaustion.

Passing now to the description of individual exercises, we shall consider more fully only those which are

applicable to cases of *right dorsal curve*, this being the commonest type of scoliosis. For cases of *left dorsal curve* all movements should be *reversed*.

The patients start with simple exercises, and are very gradually taught to do more complicated ones. To the simple exercises belongs "*sitting side bending*" of the trunk towards the convexity of the curve, which in our case will always be the right one. The patient sits either on a high plinth, his legs strapped down to it, or on an ordinary stool, his feet twisted round the legs of the stool, so as to add more to his security. He places both his hands on the back of his head, expanding his chest, and raising his chin. The side bending movement is carried out slowly, and the respiration is watched. Bending and raising of the trunk to the original position should occupy at least ten seconds altogether, a slight pause being made before the exercise is repeated. One ought to reckon one minute for every four movements, and three minutes for a dozen. This exercise can be rendered stronger, that is of more effect on the spine, if the surgeon places his right hand on the convexity, and his left hand under the patient's left elbow (or under his arm), thus assisting in the flexion of the trunk (Figs. 22 and 23).

Another useful exercise is "*sitting forward bending*" of the trunk, which can be done without the patient changing his former sitting position. The patient lifts his left arm straight up in one line with the spine, and places his right hand on the convexity of the curve, the thumb looking backward. The right hand exercises pressure on the curve, and the left arm is forcibly

FIG. 22.—A CASE OF POSTURAL RIGHT DORSAL CURVATURE.

Note the small amount of rotation of the vertebræ, typical in postural scoliosis and in contrast with organic scoliosis.

FIG. 23.—THE SAME CASE AS FIG. 22. "SITTING SIDE BENDING," WITH PRESSURE ON THE CONVEXITY.

stretched out, thus rotating the shoulder, which pulls the spine over to the left side. The surgeon helps to correct the deformity by grasping the patient's left hand

FIG. 24.—THE SAME CASE AS FIGS. 22 AND 23. "FORWARD BENDING": SITTING, WITH PRESSURE ON THE CONVEXITY AND TRACTION OF THE LEFT ARM.

above the wrist joint with his left, and placing his right hand on or above the patient's right, which is pressing on the "hump." The surgeon pulls the patient's arm upwards and at the same time exercises

pressure on the curve (Fig. 24), especially at the moment when the patient begins to raise his trunk to the original position. Full expiration is made during flexion, and a deep inspiration during extension of the spine.

"*Crawling exercises*"—introduced by Professor Rudolph Klapp—have the great advantage of correcting the deformity, whilst the weight of the body is taken off the spine. The patient crouches on all his fours in such a manner as to keep both his right extremities as close to each other as possible; the left leg and the left arm, however, are stretched out. The patient performs crawling movement in as small a circle as possible, all the time endeavouring to maintain the same relation of his limbs. The hands are protected by gloves, and the knees are wrapped up in some flannel. Also small square pieces of thick felt may be fixed to the parts exposed to pressure by means of an elastic bandage. The left arm has to make far-reaching movements forward, and the left leg has to remain far behind its fellow. The patient moves along only in the direction of the curvature, so that if it is a case of right dorsal curve, the direction is identical with that of the hands of a clock. Left dorsal curve becomes straightened out through the reverse. Crawling exercises are to be practised by the patients at home for at least fifteen minutes, night and morning.

A double curve or S-scoliosis requires a different arrangement of the limbs, which in that case must be stretched out crossways: the right arm and the left leg or *vice versa*.

"*Side lying*" on the side of the concavity is a posi-

tion in which the weight of the body is used as the correcting factor. This posture should be habitually assumed by the patients when resting, or even when sleeping. The real advantage of this correcting position is that it influences the spine during a great part of the day.

If *compensatory curves* have already developed markedly, combined movements are of more use than simple ones. For instance, in the case of right dorsal curvature, the compensatory curves being left lumbar and left cervical, I find the following exercise very useful.

The patient places both hands on the back of the head, which is kept bent to the left, thus undoing the cervical curve. The legs are kept wide apart, and the weight of the body is thrown on the right foot, thus undoing the lumbar curve. The right knee is now bent, and at the same time the spine flexed to the right, the dorsal curve being thus undone. Rotation of the vertebræ, always present in more advanced cases, is overcome by a slight twist of the trunk towards the convexity, achieved by the patient facing his right knee, when bending over it. In this way a treble curve is corrected by one exercise, which, though rather complicated, is easily learnt by degrees.

Extension and flexion of the arms forward and sideways in standing or sitting, with the spine held in a correct position, help the patient to train his *muscular sensation*, and to get accustomed to perform the everyday movements in a good erect posture.

"*Side hanging*" is a powerful means of correcting

spinal curvature in the dorsal region. The patient is placed with his convex side right across a well-padded boom, the head and the legs being slightly supported by the surgeon. If the person treated is a child, which is mostly the case, any soft object, such as the back of a sofa or that of an easy chair, will do for this purpose. Care must be taken lest the deformity should become aggravated by compressing the ribs. It should, therefore, be remembered that pressure is to be applied to the *top* of the "hump," and not to the parts beyond it.

These are just a few examples of spinal exercises which can easily be applied to the typical cases of total or C-scoliosis in general practice. Most cases of slight curvature can be cured, if treated by the above exercises alone.

The following are a few *class* exercises, that is exercises which can be done by several patients together. They are suitable in very slight cases showing just the beginning of a deformity, and can, of course, be combined with the above-mentioned ones. In all of them great stress is laid on deep respiration and on the correct position of the shoulders as well as of the rest of the body.

Standing arms parting;

Standing arms stretching upwards, sideways and downwards;

Heels raising and knee bending, with hands on the hips;

Knee up-bending (alternately), with hands on the hips;

Standing arms circling;

Standing arms flinging;

Standing arms rotating outwards, head extending.

Advanced cases of scoliosis require special attention, and celluloid *jackets* are often necessary in order to reduce a certain amount of deformity and compression of the viscera. Simple celluloid jackets can be made by any medical man without difficulty. The main part of the work is the cast. First, a negative is obtained of the patient's back. This is done by putting several layers of plaster of-Paris bandages on the extended back, and cutting them open at one side. The body has been previously well anointed with vaseline. A bottom is made to the negative, and another bandage carried round the whole, so as to close all the rents, and thus to prevent leakage. As soon as it is dry, it is well rubbed with some grease inside, and filled with plaster-of-Paris. In a day or two the negative is cut open again, and the positive taken out. The cast thus obtained represents the patient's back in a corrected position. On this model, first a woollen vest is placed. On top of that a layer of book muslin is wrapped round. This has to be previously cut up into strips of about a yard in length, and about six inches wide, because this facilitates the shaping of the jacket. The muslin thus prepared, and placed on the cast, is painted over with a solution of celluloid in acetone. As soon as this gets dry—which takes place in a few hours—another layer of muslin is wound round the first layer, and painted again. In such a manner about a dozen or more layers of muslin and celluloid are placed on top of each other. When perfectly dry, the jacket is cut open in front. Leather straps and buckles are fixed

to it after it has been removed from the cast, and small pads of cotton wool fastened to those points inside the jacket which are in contact with such prominent parts as the sacrum and the top of the curvature. If the deformity is very marked the jacket should be applied in a recumbent position by the patient himself.

FIG. 25.—BREATHING EXERCISES IN LYING.
Photograph shows the moment of deepest inspiration and maximum extension of the arms.

Celluloid can be made non-inflammable through the addition of certain salts.

Respiration is generally very defective in scoliotic subjects ; therefore special *respiratory movements* should be practised every day, at the beginning of each sitting. The following movement is very useful because it combines expansion of the chest with stretching of the spine.

The patient is lying on his back, his hands by his

sides, the surgeon sitting beyond the patient's head holds both the patient's hands in his own corresponding ones. The surgeon gradually draws the patient's arms upwards, whilst the latter is told to take a deep breath. Having reached the limit of extension, the surgeon ceases to exercise traction on the arms, and the patient begins now to draw the surgeon's hands downwards to the original position. Full expiration is made during this period. Both these movements have to be carried out, as far as possible, in the plane of the body of the patient, who must be told to keep his elbows all the time in contact with the couch. The whole movement is repeated about a dozen times. As the patient gains strength, this exercise is gradually rendered more difficult by adding resistance on the part of the surgeon, and by allowing the patient's legs to hang over the foot end of the couch, thus increasing the extension of the spine (Fig. 25).

The last-named exercise is also very helpful in the treatment of *kyphosis* or *round shoulders*, especially when slightly modified. One or two cushions placed just under the most prominent part of the spine, and acting thus as a fulcrum, considerably increase the extension of the vertebral column. This, however, must be done with caution, so as not to cause any pain or discomfort. Similar exercises are given in sitting posture, the back of the patient resting against the surgeon's knee. "*Sitting flexion and extension*" of the trunk, with the patient's hands placed either on his hips or on the back of his head, ought to be always done with a certain amount of resistance

applied to the "hump." *Swimming* movements are generally very useful, especially if accompanied by deep breathing.

A point of great importance in all these exercises is the carriage of the head. The patient must be constantly reminded to lift his head up as high as he can, because only then a deep inspiration can be made, and a proper expansion of the thorax take place.

Cases of *kypho-scoliosis* will of course require a combination of both kinds of exercises, described under scoliosis and kyphosis.

It is taken for granted that in all cases in which scoliosis is due to an inequality of the lower extremities (with regard to their length), the shorter leg will be lengthened, either by a thickening of the sole of the boot outside, or by an elevator inside, or both. As it was repeatedly found that a large percentage of scoliosis cases is caused by often very trivial differences of the legs, every case of spinal curvature should be carefully examined in this respect in the beginning of the treatment.

Spinal deformities originating from an *empyema* especially require breathing exercises.

Genu valgum as well as *genu varum* in children under the *age of six to seven* are to a great extent amenable to mechanic treatment. The application of splints alone is never satisfactory, as it only helps to weaken the limbs, favouring atrophy of the muscles. Although it is very important indeed not to allow rickety children to run about, yet it would be a great mistake not to give them any exercises instead. Active movements

cannot always be carried out properly by children of that age, so that passive ones have to be chiefly relied upon. Besides flexion and extension of the knee, special movements tending to undo the deformity are practised night and morning. The child's thigh is grasped with one hand, and the leg with the other, and bending as well as stretching movements are carried out, whilst an attempt is made to straighten out the curve. By such manipulations the ligaments become loosened on the concave side, and the soft cartilage, covering the bone ends, undergoes a transformation which is necessary to correct the faulty architecture of the joint. General application of mechano-therapeutic measures in such cases will be considered lower down under rickets, in the chapter on constitutional diseases.

Knock-knee and bow-legs in *adolescents* are past that stage at which softness of the structures would permit of a bloodless correction. But if an operation has been carried out, massage should be employed from the first, and movements carried out in the knee joints should follow within a few days. Otherwise great stiffness will result. The same applies to such an operation as the subtrochanteric osteotomy, performed for the correction of *coxa vara*. A case of this kind in which massage and movements were only adopted six weeks after the operation taught me how unwise it is to immobilise the whole extremity for so long a period. The patient's knee became so stiff and painful that one might have thought it was Macewen's operation, and not a subtrochanteric division of the femur that had been performed in this case.

The importance of early movements after Murphy's arthro-plastic operation or after joint *excisions* is, I think, obvious enough, so as to render all further explanations superfluous. Mobilisation of limbs must, however, take place *a few days after* the operation, if it is to be of any use whatever.

A very common complaint is *flat foot*. If every medical man could take the trouble to examine all his patients who suffer from pains in the feet, he would find that 99 per cent. of them represent flat feet of some kind or other. Mostly it is the first or second stage of pes planus that the general practitioner has to deal with. And it is just these two first stages that can be cured by exercises alone.

The first stage is *pain* without deformity. The second stage is pain plus *deformity*, which, however, can be corrected by manipulations of the surgeon. In the third stage deformity can only be corrected by great force under anæsthesia.

There are two kinds of *exercises* for flat foot. Some may be practised by the patients at home, the others require assistance of the surgeon. Patients ought to make it a rule to put their feet *parallel* when walking, and not to evert them, as most people do. This is one of the first causes of flat feet, probably provoked, or favoured, by ill-fitting shoes. Peasants in certain countries of Europe, for instance in Poland, who never wear boots except on rare occasions, always place their feet parallel, and flat foot is scarcely at all known amongst them. The same is reported of natives in tropical lands.

Besides following the example of primitive people in

this respect, flat-footed patients should practise walking round the room on the *outer border of their feet*, heels raised off the ground, until they get tired (Fig. 26).

FIG. 26.—WALKING ON THE OUTER BORDER OF THE FEET, HEELS BEING RAISED OFF THE GROUND.

Tip-toeing, with heels kept wide apart, and the toes turned in, should be repeated at least twelve to twenty-four times, morning and evening (see Fig. 16). This can be modified and rendered more difficult by not allowing the patient to touch the ground with his heels. Lifting oneself up on the outer borders of the feet without letting one's heels touch the ground is equally good.

Apart from these very important exercises, patients have to perform movements with their feet in all directions except one. Flexion, extension, adduction, and circumduction, are carried out first without, then with, resistance; abduction, however, is left out on account of its favouring the flattening of the foot. Resistance is effected by the surgeon's hands, one of which grasps the leg just above the ankle, and the other across the metatarsals.

Massage in these cases consists of stroking of the

calf of the leg upward, as well as of the dorsum of the foot. Kneading is done by placing both thumbs on the dorsum, and the fingers on the sole of the foot. The region of the calcaneo-scaphoid ligament is attended to with special care, this being the most tender spot of the foot. Should the arch be flattened, the foot is bent repeatedly into the proper shape.

Pain is the first symptom to abate during such treatment; after this follows the deformity. If the case requires an application of plaster-of-Paris for the sake of correcting the deformity, movements and massage are employed as soon as the plaster is removed. The *plaster must not be left on too long*, a fortnight being the maximum, on account of *muscular atrophy* which frequently occurs. Rest in bed is sometimes necessary in cases where pain is unbearable, or where there is a great deal of *muscular spasm* in the *peronei*.

Congenital flat foot, just as other *congenital deformities*, such as club-foot or talipes equino-varus, always requires individual consideration, so that the treatment will be a different one in every case. It is, however, important to remember that during the first month of life, as well as *after tenotomies*, or plaster-of-Paris redressments, massage and movements alone, or combined with light splints or orthopædic boots, are of an enormous value.

The same is to be said about *paralytic deformities* such as those resulting from infantile paralysis and others (see nervous disorders). It is to be borne in mind that only exercises can really strengthen a muscle —rest can only weaken it; this is a physiological fact which nothing can alter.

Massage should always be adopted *as early as it can be*, because it has been noticed that the paralysis goes back and muscles recover to a greater extent if properly attended to without delay than if left alone until *contractures* begin to appear. Paralytic conditions, due to injuries or tight splints, are on the whole treated similarly.

In old-standing cases, or in cases where one group of muscles is entirely paralysed, *splints* are of great service. They help to overcome the action of those muscles which were left intact, thus preventing contractures. How far even very inveterate cases are capable of improvement may be seen, from the two pictures illustrating the case of Volkmann's ischæmic contracture of the hand, referred to above (Figs. 5 and 6).

Traumatic congenital torticollis, due to rupture of the sterno-mastoid during delivery of the head, seen *soon after birth*, can be greatly improved if attacked at once by manipulations. To hasten the absorption of blood, massage in the shape of very gentle kneading is applied to the torn muscle, by pinching it between the thumbs and the first and second fingers. Later on energetic passive movements of the head, which put the damaged muscle on stretch, tend to prevent cicatricial shortening. To that end the infant's head is grasped by the surgeon with one hand, the other being placed on the shoulder of the affected side, so as to steady the child's trunk. The head is first rotated in the opposite direction, and then extended in order to overcome the action of the contracted sterno-mastoid, which is a double one: flexion and rotation. Too much force must not be employed, because of the risk

of a fresh rupture. The treatment should be continued for several months to prevent relapses.

Also in adults mechano-therapeutic treatment is most advisable after an operative division of the tendon. Movements of all kinds should be employed with great perseverance, here again with the object of preventing recurrence. An elastic bandage may be worn for some time to keep the head permanently in a correct position—also a poroplastic collar may be tried, but should not be relied upon as the only measure.

Sprengel's shoulder, if noticed *shortly after birth*, can be considerably improved by gymnastic exercises, tending to increase the expansion of the chest. Swimming movements, breathing exercises, bracing the shoulders, in fact, every kind of movement mobilising the scapulæ, bringing them down and forcing them backwards, are of use. Should, however, a bony bridge be present between the upper angle of the shoulder-blade and one of the vertebræ—which is frequently the case—this must be severed by operative measures, and the exercises just described started without delay, and carried out for months. The older the deformity, the greater the difficulty of correcting it, and the more energy and perseverance has to be put into the treatment in order to obtain satisfactory results.

II. MEDICAL

THE application of massage in internal disorders requires so much care and consideration—more even than is necessary in most of the surgical complaints mentioned above—that the author cannot help realising the great responsibility resting with all those persons who are left in charge of the administration of this therapeutic agent.

Whereas the group of disorders referred to in the first part of this book consisted mainly of troubles affecting easily accessible and less vital parts, such as limbs and other peripheral structures, all internal diseases have a distinct bearing on the whole organism, most of the parts thus affected being of first importance.

In the majority of cases now to be considered, the diseased organs can only be *indirectly* influenced by means of cautious manipulations, the effect of which can only be defined by careful clinical observation. It is clear therefore that no one who does not possess some knowledge of both, manipulations and observation, should treat such cases.

Being fully aware of his own responsibility in recommending mechano-therapeutic treatment to others, the author has a strong desire to collect only reliable

material, as far as this is possible, and to avoid the quotations of some too enthusiastic writers.

Those who have grasped the true meaning of mechano-therapeutics—which, in fact, is suggested by the name itself—will understand that only such diseases can be *directly* and successfully influenced by massage and movements, whose origin is due to some derangement of the mechanical forces governing healthy organisms. Hence it is not very likely that massage would have any direct effect on such troubles as fevers or parasites. Nevertheless, by improving the circulation, they may help to eliminate toxic material and waste products, and benefit the patient in this roundabout way.

Constitutional disorders, due to a slow or defective metabolism, can also be influenced by our means, as far as an increased amount of physical work is capable of hastening and increasing the exchange of matter.

The dangers of rubbing a malignant tumour, or an abdominal abscess, and causing metastasis all over the body, are too obvious to require any further explanation. It is, however, another question altogether if a patient suffering from cancer wishes to be kept alive as long as it is only possible, and massage is applied to his limbs in order to preserve their strength; but then of course, the aim is here totally different.

We pass now to the discussion of individual systems.

A. CIRCULATORY SYSTEM

The main object of physical treatment in cardiac diseases is to support the function of the heart, as that

of a *pump*. The more of its work we can take over, the better. The heart is an organ that cannot be put to rest for so and so many hours a day, and then made to perform some exercises at will; yet it requires rest when overworked, just as much as any other muscle does, and it also must be helped to get stronger when weakened through disease. Physiology, however, teaches us that the only means of strengthening a muscle is exercises. Hence it is perfectly clear that in order to satisfy all these points *we have to pump for the heart* on the one hand, and on the other hand *to train the cardiac muscle*.

We can put this theory into simple words, and explain it in the following way.

Supposing we had before us a system of pipes filled with water and corresponding to the circulatory system of the human body; and in the centre of this system one big pump to keep the water going round and round, in order to supply different parts. Supposing this pump was breaking down, and required a thorough repair, but at the same time it was not possible to remove it to the workshop. The best way of maintaining the water supply under such circumstances would be to put up a few smaller pumps in different places; since it does not much matter whether the pumping is done in the centre, or at the periphery of the system, as long as the amount of work carried out is the same. This, however, is precisely the thing we intend doing in a cardiac breakdown, because, after all, our circulation is nothing else but a process of pumping blood from one place to another, and if our pump goes wrong

everything goes wrong, the health of distant parts suffering most.

With regard to the effect on the circulation, it is of no importance whatsoever whether the breakdown of the heart is due to weakness of the cardiac muscle or to vegetations on a semi-lunar or a bicuspid. Just so little it matters to the water supply whether the stagnation is caused by a defect in the cylinder or a valve.

As far as the treatment is concerned, it is not of much importance whether the case before us is one of *myocarditis* or *endocarditis*. The more exact diagnosis may, however, be of value when the *prognosis* is being considered.

The moment we notice signs of *incompensation* we have to step in, and do part of the heart's work, just that part which appears to have become too much for its strength.

Let us now consider what results are actually achieved in these cases by drugs, and let us take digitalis as a cardiac remedy *par excellence*. We know that its chief effect is that of a stimulant to the cardiac action by making the systole more complete, and by lengthening the diastole. As one part of the diastole of the ventricles is the only time during which the heart is really resting, any prolongation of that period must benefit the heart itself, and on the other hand any increase of its energy during its contraction must benefit the circulation. All this seems very logical until one realises the fact that sooner or later the effect of both these actions is bound to become *nil*: whatever strength is gained by the

heart through the prolongation of its rest time, is spent on the increased force of its systole.

The medicinal therapy has another drawback besides the one just mentioned, and it does not much matter which drug is administered. Cardiac stimulants merely *exhaust* the organ, which, being spurred on, does its level best, only in order to *collapse* after a short while, as there is no such stimulus which would not be followed by reaction. If we want to tide the patient over a short critical period, reckoning on a natural solution of the situation later on, we need not take this point too seriously into consideration. Things are, however, different when we know by experience that the period of defective compensation is going to last for weeks, if not for months; to administer stimulants then, and thus to exhaust the neuro-muscular apparatus of the heart in a short time, is, to say the least, unwise. It would be just as unreasonable to correct the action of a bad pump whose valves are broken or whose piston is crooked, by putting on more steam.

It is a well-known fact that *muscular action* promotes arterial circulation in that part of the body which is being moved. This can already be deduced from the appearance of the skin alone. The contraction of a muscle acts like a pump, or, still better, like a great number of small pumps, because each fibre in its way exercises pressure or suction on the neighbouring blood-vessels. There are other signs of an increased circulation besides, such as, for example, warmth—partly also due to other processes—and the increase of volume of the parts observed, which swell and become softer and more

elastic, on account of a greater amount of fluid in the blood-vessels. This latter condition is so different from an œdema, where the fluid has left the vessels, and has accumulated in the tissues around, that they can readily be distinguished from one another by touch.

It is commonly observed that a quick *stroking* movement carried out with a finger along a *cutaneous vein*—especially in a *centripetal* direction—flattens the vein for a period lasting considerably longer than the movement itself. This shows that stroking of the skin presses the blood out of the cutaneous veins, thus producing negative pressure in the blood-vessels, and that such manipulations suck the blood from the periphery to the centre.

In these two agents—*muscular action* and *centripetal stroking* of the body surface—we have examples of mechano-therapeutic factors which, by means of peripheral pressure and suction alone, help to restore normal conditions in a perturbed circulatory system.

Besides these, however, there are other equally important and helpful factors. The enormous influence of the *respiration* on circulation can be utilised to the same end. There are particular movements of certain *joints* which undoubtedly help pumping blood to and from the limbs. Also *kneading of the extremities* assists in the absorption of œdemata by pushing the transudates out of the lymph-spaces into the lymph-vessels, thus driving the fluid back into the system.

Finally, there is at our disposal the use of that large reservoir represented by the *abdominal blood-vessels*, which we can fill with the overflowing fluid, and so

relieve the circulation. To give an idea of the capacity of these vessels it might be mentioned that cases of sudden death have been reported in which the unexpected end was found to be due to cerebral anæmia, caused by a too rapid tapping of ascites, and the consequent sudden dilatation of the abdominal blood-vessels. Artificially, we can, to a certain extent, produce a similar effect by irritating the splanchnic nerves through manipulations, such as *abdominal massage* in the shape of very deep kneading. The obvious signs thus produced are: an increased temperature of the abdomen, a more or less marked drowsiness of the patient—due to a slight anæmia of the brain—and a slower pulse as the result of reflex stimulation of the vagus.

The effect of *deep inspiration* on the circulation has been so thoroughly investigated by physiologists that it is unnecessary to describe it here at any length. It suggests, however, one more way of relieving the overburdened heart by deep inspiratory movements of the thorax, which create a considerable negative pressure in the big trunks of the venous system, and thus suck the blood from the periphery with an enormous force. In order to achieve a still greater pumping effect, breathing movements may be considerably deepened with the aid of the physician, the patient himself making no efforts in this direction at all.

The anatomy and the mechanism of certain joints show us another way of assisting the flow of blood by means of *passive movements*. The blood-supply of joints is, in general, very abundant, but some joints possess particularly extensive anastomosis, such as, for

example, the hip joint; the number of veins round the ankle joint is very great too, and *quick rotatory movements* carried out at these joints by twisting, stretching, and compressing the blood-vessels pump the blood very effectively. Flexion and extension of the thigh have a similar effect by compressing the femoral artery and vein against Poupart's ligament. This latter action has been compared to some one treading rhythmically on a garden hose, and making the water squirt out with a still greater force.

Based on the foregoing considerations we can easily outline the *plan of treatment in cardiac diseases*, though the kind and the amount of manipulations adopted in every case must necessarily depend on the condition of the heart. In bad cases great caution should be exercised, and very slow progress only can be expected.

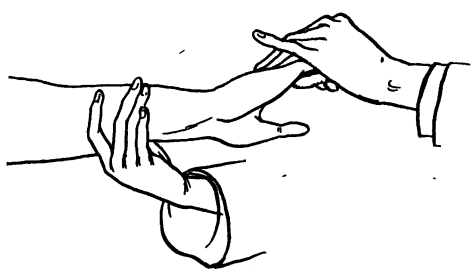

FIG. 27.—WRIST ROLLING.

If the patient is very feeble, we begin with *stroking and kneading* of his extremities alone. The calves and the thighs, as well as the forearms and the upper arms, are methodically massaged in order to reduce the

œdema, and to relieve the discomfort produced by it. Passive exercises, such as *foot rolling* and *wrist rolling* (Fig. 27), plus flexion and extension in these joints, are gradually added.

It is absolutely necessary *to watch the pulse*, by taking it before, during, and after the daily treatment.

Gradually, *hip rolling* is introduced, though this may be started with right away, if the condition of the patient allows it, and if these movements will not have any deteriorating effect on the pulse. Hip rolling is given *quite passively*, and is done by the physician, who with one hand grasps the patient's foot, placing his palm under the sole, and the thumb on the dorsum, and with the other hand gets hold of the leg just above the knee, which is kept bent. Circumduction is carried out in the hip joint without any assistance of the patient, who must learn to relax all his muscles, so as not to exercise any resistance whatever.

Arm rolling is a much stronger movement, which is given in a sitting posture, and therefore only applied to lighter or more improved cases.

Abdominal massage—which will be described in more detail in the chapter on the digestive system—ought to be employed in every heart case. Besides the influence on the circulation it has a definite effect on the digestion, which is often out of order in these cases.

Trunk exercises are of a great variety, and should be practised according to the strength of the patient. We begin with the lightest one.

"*Trunk lifting*" or "*trunk raising*" is carried out without in the least disturbing the patient. The

physician stands at the head of the bed and takes hold of the patient's shoulders by placing his palms over the shoulders and under the armpits, the thumbs on the acromion. The patient is told to *breathe deeply*, and with every inspiration the physician pulls the shoulders upwards as far as it is possible, and then lets them return to their original position. After a short pause, lasting until the next inspiration, the movement is repeated. Should any unpleasant symptoms, such as giddiness or palpitation, occur during exercises, these have to be either interrupted, or carried out with less force. Gradually, other *breathing movements*, like those described in connection with scoliosis, may be added, and are, as a rule, found here very useful.

As soon as the patient is able to sit up, "*trunk rolling*" is indicated, and the patient is now, to a certain extent, expected to assist the doctor. The patient sits on a stool, his hands resting on his hips, and the physician, placing his hands on the patient's shoulders, makes him perform rotatory movements involving the upper part of his body. The pulse must be taken every few minutes, and, should tachycardia be observed, the patient must immediately lie down to rest. *Trunk lifting* can also be done in sitting.

The effect of all these manipulations is precisely the same as that of digitalis: the pulse becomes fuller and more regular, its rate approaching the normal; the effect, however, is here a more lasting one. This is explained by the fact that the heart's work has been actually diminished, instead of being increased—as is the case with most cardiac stimuli. Such treatment

gives the pumping organ a good chance to recover, and, by lowering the blood pressure, makes cardiac failure from overwork practically impossible, provided that no new aggravating factors supervene.

Mechano-therapy possesses another, more direct, method of influencing the cardiac action, by either increasing or decreasing the pulse rate and the blood pressure. This is effected by a *direct* application of certain manipulations to the cardiac region. The experiments of Levin of Stockholm, who took about 8,000 pulse measurements, showed that *stroking* and *gentle vibration* of the cardiac region *reduce* the blood pressure and the pulse rate (by 10–20 heart-beats). *Hacking*, and a more vigorous *percussion of the thorax* over the heart, produce *raising* of the blood pressure and an increased pulse rate (8–10). As this, however, is not always equally well borne by all patients, it should not be indiscriminately insisted upon.

Abdominal massage also *reduces* the pulse rate considerably; this is most likely due to a stimulation of the vagus, which has a depressory influence on the heart. (The author succeeded in lowering the blood pressure in one sitting by 10 Hg:, this having been the effect of very gentle vibrations applied to the cardiac region, and carried out with the hand alone.)

All the manipulations described above are applicable to cases with a more or less marked *loss of compensation*, since they are all meant to reduce the heart's work. Should this help on to a complete return of compensation, measures must be taken in order to *strengthen the cardiac muscle* so as to make it capable of performing

the usual amount of work expected from a normal organ, and not merely of maintaining the circulation under such favourable conditions as rest in bed and daily massage. This can only be achieved by *active exercises.*

Gradual increase of work strengthens the heart muscle as it strengthens other muscles. This, however, is only possible after a prolonged period of cardiac rest in the beginning of the treatment just described. The plus work consisting of exercises is, of course, not carried out all day long, but during a very small part of it only.

The active exercises here adopted are even more numerous than the passive ones. Besides those already mentioned, which can also be done voluntarily, there are many others, comprising, in fact, every possible movement of the body. All of them can also be performed against resistance. This circumstance gives us means of regulating their force at will, and thus enables us to have a direct control over the heart's work.

Movements involving the extremities are less fatiguing for the patient than those of the trunk, on account of their smaller weight. Thus, requiring less muscular action, the *legs* and the *arms* should first be commenced with ; flexion and extension, abduction, adduction and rotation of the feet and wrists, as well as movements of the elbow and the knee, shoulder and hip joints, are employed either in lying, sitting, or standing. The pulse is, of course, taken frequently to prevent unpleasant complications.

Though practised by the Swedish gymnasts long before

Schott, most of the resisted exercises were included in what is nowadays termed the "*Nauheim treatment.*" They are of beneficial influence in cases of *dilatation* of the heart, tending to diminish the area of cardiac dulness, as proved by percussion. Also *irregularities* of all kinds, especially those following infectious diseases, are often completely cured. Patients suffering from a simple nervous palpitation, or from some other kind of an abnormally agitated cardiac action, always express their satisfaction at the soothing effect of massage and movements, and find that each sitting steadies their heart, and relieves the oppression in the chest. Cases of *valvular disease* are helped to maintain a satisfactory compensation, or to regain it if the latter has been lost.

Little definite can be said of the duration of the treatment, as it always depends on the individual case. However, a lasting effect can be obtained already after a course of six weeks, shorter treatment being of use only in very mild cases. Another course of six weeks is sometimes required after an interval of a few months, and there is, of course, no objection to a prudent administration of drugs in conjunction with physical therapy.

B. RESPIRATORY SYSTEM

At first sight it may perhaps seem strange that mechano-therapeutics could have any bearing whatever on this group of maladies. Experience, however, furnishes us with ample evidence that the application of mechanical treatment in selected cases is undoubtedly

of great value. Thus, we have in *Sylvester's method of resuscitation of the drowned* the best proof of the efficacy of mechanic measures as applied to cases of *asphyxia*. The value of artificial respiration will hardly be questioned by anybody who has had to adopt it in critical moments.

Massage plays an important rôle as a preventive measure against *hypostatic pneumonia* in old or very debilitated persons, who have to be confined to their beds for a long period. The only cause of this trouble is—as suggested by the name itself—a defective circulation, such as a stasis in the big pulmonary blood-vessels.

In the foregoing chapter means were described with the aid of which bad circulation could be improved in cardiac diseases. Hypostasis of the lungs, being only a symptom of deficient cardiac activity, and not a disease in itself, must be treated on the same lines as all the other circulatory troubles. To avoid unnecessary repetition, readers are referred to the chapter on circulatory system.

An addition now worth making is the *clapping* of the thorax with both hands as well as *shaking*: two movements which hold good in all pulmonary troubles treated by massage. They are done by placing both hands flat on the patient's chest, and clapping it systematically all over, whilst the patient is either sitting or *standing*. The physician then, without changing his position, turns his hands over, and does the same manipulation on the patient's back, moving up and down, and to the sides. The clapping has to be carried out

extremely gently, and must not cause any pain or discomfort whatever.

The shaking, one of the most difficult movements that exists, is carried out in the *recumbent posture* as follows. One slips both one's hands high up under the patient's shoulders, palms upwards (the patient lying on his back), then, lifting the patient's trunk slightly off the bed, his thorax is shaken by gentle vibratory movements, whilst the hands are sliding in a downward and outward direction towards the hypochondriac region. This being reached, the movement is finished off by a gentle compression of the thorax. Both these movements, shaking as well as clapping, require practice combined with some skill on the part of the administrator, and an absolute passivity and *deep respiration* on the part of the patient. Clapping is done with both hands alternately during the patient's expiration, as well as during the inspiration, whereas in shaking both hands are employed simultaneously, and only during the expiration.

Clapping and shaking are successfully applied in those pulmonary complaints where there is a great difficulty of expectoration, in *chronic bronchitis* for example. This is pre-eminently benefited by such manipulations, as they loosen the tough secretion, and help to detach it from the mucous membrane of the bronchi. How far this is possible, anybody can test for himself, though not suffering from any definite respiratory trouble: after two or three such movements he will probably find it necessary to clear his throat, if not actually to cough up some phlegm, the source of which is not apparent.

In fact, every chronic condition of the respiratory tract associated with an abundant and thick secretion, such as *asthma*, *emphysema*, *bronchiectasis* or *fibrinous bronchitis*, is likely to derive benefit from mechanical treatment.

That these methods are particularly called for in cases where the pulmonary trouble has been caused by a primary heart disease, need not be especially emphasised. In cases of a compressed or collapsed lung with old-standing *pleuritic adhesions* the exercises are directed towards increasing the vital capacity, *chest lifting* and *trunk rolling* being here particularly suitable.

Acute and *chronic catarrhal laryngitis* are to a great extent curable by massage of the neck carried out with the intention of reducing the *congestion of the throat*. We can achieve this by emptying the jugular veins on both sides of the neck, as well as by influencing the lymphatics. This is best done by deep downward

FIG. 28.—NECK MASSAGE.
First Stage of Stroking.

stroking manipulations carried out along the anterior borders of the sterno-mastoids in the following manner. The patient sits with his neck exposed, and his head

is supported against the back of an easy-chair. The physician stands in front of him, and places both ulnar borders of his hands behind the patient's ears (Fig. 28). Then, moving his hands downward, he presses them

FIG. 29.—NECK MASSAGE.
Second Stage of Stroking.

into the grooves in which the big blood-vessels are situated. Arriving at the middle of the sterno-mastoids, he quickly turns his hands round, so that the ulnar borders are replaced by the thumbs, which continue the movement as far as the sterno-clavicular joint (Fig. 29). This manipulation must be done firmly, yet lightly and quickly, and should be frequently repeated during five to ten minutes daily.

Besides this, vibrations should be applied, if possible, to the larynx by means of an electric motor, placing a soft flat rubber piece to both sides of the thyroid cartilage. This helps to detach the secretions from the mucous membrane, and at the same time it supplies the affected organ with fresh blood. To do this kind of massage with the fingers is extremely fatiguing, though this was originally practised in Sweden. A

small round rubber piece of a harder consistence than the first one is used to influence the deep cervical vessels and glands. Some go even so far as to massage the axillary glands, which, however, is hardly ever necessary.

That massage is most useful in cases of *catarrhal pharyngitis* and *laryngitis* can be experienced by every one who, when suffering from either of these complaints, applies gentle rubbing to his throat: the unpleasant feeling in the pharynx and the hoarseness will thus be soon relieved.

It will be seen from the description of the following case of mine how even inveterate cases may be benefited by massage. A young singer for several years suffered from catarrhal laryngitis, and though her voice was otherwise considered very good she had to clear her voice every few minutes, especially whilst singing. In talking, her voice often broke down, and she had to make great efforts in order to get rid of the temporary hoarseness. During two months she received daily treatment on the lines described above, practising being quite forbidden for that period, and she improved so far that at the end of the term, in spite of her missing several months, she obtained a medal at the Academy.

C. DIGESTIVE SYSTEM

The main views expressed in the other chapters hold good here, and we find that those digestive troubles which are due to mechanical causes are benefited by

mechano-therapeutic measures. Great improvement may be expected from massage where the *motility* of the intestinal apparatus is impaired, and where the primary cause lies either in the *atony of the muscular wall of the viscera*, or in the *weakness of the abdominal wall*. Of course, cases in which the functions of the bowels are in any way impaired by an acute or a chronic *obstruction*, being unsuitable for massage, will, as a rule, necessitate the adoption of operative measures.

In cases of *dilatation of the stomach*, the gastric contents, failing to be transmitted through the pylorus into the duodenum within the proper time, must be pushed along by mechanical means; otherwise stasis, fermentation, and great discomfort will arise. There is no other way of emptying the stomach in the right direction, except with our hands used as a substitute for the normal action of the gastric musculature.

Particularly well suited for our treatment are *vibrations* when applied to the epigastric region. They may either be carried out with the hands, which are placed flat on the abdomen, the fingers transmitting the shaking movements on to the stomach, or a motor may be used. In the latter case a soft rubber piece is chosen, though manual treatment is much to be preferred.

The treatment begins under the left hypochondrium, where the cardiac orifice is expected to lie, and is continued towards the pylorus. The hands are held slightly inclined towards the outlet, and they have to perform such movements which tend to expel the

gastric contents into the duodenum. These manipulations, however, ought not to be performed too soon after the patient has taken his food: one or two hours after a light meal will as a rule suffice in order to prevent all unpleasant sensations.

Dilatation of the stomach is often combined with a general atony of the intestines resulting in constipation, and therefore general abdominal massage is always indicated in these cases. As, however, constipation is a complaint in which nowadays massage has become the most popular kind of treatment, advocated by the highest medical authorities, special attention must now be given to this widespread mischief and to its cure.

Constipation is mainly due to a *sluggish peristalsis* which causes an abnormal absorption of water, and therefore an excessive inspissation of fæces. Hastening of peristaltic movements, on the other hand, always provokes soft stools. Most of the aperients used have an accelerating influence on the intestinal action, either through an irritation of the mucous membrane, or through a stimulation of Auerbach's plexus. Other drugs, such as opium, for instance, cause artificial constipation by slowing down the peristalsis. Unfortunately, the effect of drugs is in reverse proportion to the length of time during which they are administered. The excitability of the nerve centres as well as of the mucous membrane of the intestines, becomes lessened and replaced by an increasing indifference to such stimuli. And, as the habit of taking aperients grows, so the doses have to be enlarged. The result of such

practice is, generally speaking, a total failure after a few months, or years.

The proper and the most ideal treatment of constipation would be that which would *strengthen the unstriped muscles of the whole intestinal tract*; but *par excellence* it is the muscular coat of the *large intestine* that has to be strengthened. Only those measures can be really successful which tend to establish normal conditions. Habitual taking of remedies, however, cannot be called normal. The only method approaching this ideal treatment is afforded by mechano-therapy; since in this case, as well as in all the others, the object of our treatment is the strengthening of muscular tissues through *exercising* them.

Massage of the abdomen consists in the first place of bimanual *kneading* all along the *ascending, transverse, and descending colon* in a circle, thus following the physiological direction of the peristalsis. The patient is lying with his head raised and his knees slightly flexed in order to relax the abdominal muscles as completely as possible. The hands are placed one on top of the other, the finger-tips being placed directly over the large intestine. This can be distinctly felt when containing fæcal masses.

Some patients state that as soon as massage of the cœcum is begun, they feel the necessity of emptying their bowels, an effect which is probably due to a reflex of the cœcum on the rectum. Manual treatment of this kind is much more efficient than the rolling of a cannon-ball, as advocated by some; it goes much deeper, and it helps mechanically to push along the contents of the bowel.

There are other useful manipulations belonging to abdominal massage. Such, for example, is the kneading of the whole abdomen, which is carried out much in the same way as the colon massage, only including the *small intestines* as well. Here both hands of the manipulator grasp the whole of the stomach, the patient being placed as above. The physician sits on the patient's right, and puts his right hand flat above the right iliac crest, and the left hand below the left hypochondrium. The movements are carried out so as to bring the two hands together in the middle, whilst exercising pressure on the structures below. The same is repeated after the hands have been reversed.

Massage of the *abdominal muscles* is done in the same way as that of other muscles, kneading, however, being mainly applied, since hacking would be very inappropriate on account of the unpleasant sensations thus caused, as well as on account of a possible shock. Hacking would also be quite useless without having any solid background for the parts thus treated. In kneading, the abdominal parietes have to be firmly grasped with both hands, at right-angles to the recti muscles, and treated as if they were dough.

We arrive here at a point where the condition of the abdominal muscles ought to be considered, since that is, in my opinion, as important as the intestines themselves. Indeed, there is no other factor that would favour habitual constipation as much as the weakness of the abdominal wall. Not without significance is it that we find this complaint so much more common in women, who wear *corsets*, and who do not over-indulge

in exercises, than in men. Stays and *want of physical training* produce *atrophy of the trunk muscles*, this necessarily leading to great difficulty in emptying the bowels during *defæcation*, as well as difficulty in emptying the uterus during *parturition*. Comparison is often drawn between civilised women and their primitive sisters who still use their own strong muscles as a natural support, instead of the ridiculous product of our fashions.

Ploss and other great authorities on women's customs and habits, as well as travellers, state that to most native women a confinement is just as easy and quick as an act of defæcation, which can rarely be said of our patients. These would, however, be greatly benefited in both respects by appropriate exercises, directed towards the strengthening of the abdominal muscles, and particularly of the recti muscles.

Besides massage, patients suffering from constipation ought to perform the following *movements*: lying on a bed, couch, or floor, they *raise their trunk*, whilst the hands are kept by the sides. The legs should be strapped or held by the person administering treatment, this rendering the exercises easier for beginners. Another exercise consists of "*leg raising*," whilst the trunk is kept quiet. The knees can either be bent (easier) or kept straight (more difficult). These exercises may be at first performed passively, by the medical attendant, or voluntarily, by the patient himself or herself, or against resistance, according to the strength of the patient, and the progress that has been made. Resistance is effected by placing one's hands flat on the patients'

back and chest in the case of "trunk raising," and on the knees in the case of "leg raising." Each exercise should be performed slowly, and should be repeated six to twelve times. Slight pain may be experienced in the recti muscles after the first day or two, which, however, promptly disappears. It will be surprising to find how very few women can do "trunk raising" without assistance—a movement which, as a rule, does not present any difficulties to men.

"Trunk bending" in a standing position, the hands being here placed on the hips, as well as "trunk rolling" in a sitting position, are both most useful exercises which can be practised in addition to the first-mentioned ones, combined of course with abdominal massage.

A very good, though rather complicated, movement is the following. The patient rests both hands on a mantelpiece, or, in fact, on any object on a level with his shoulders, the arms being kept at full extension all the time. The manipulator places one of his own hands on the patient's chest, and the other on his back. The patient is told to raise himself on tip-toe, and to push his trunk forward without bending the arms. The second part of this exercise consists of the patient bending his knees completely, without getting down on his heels. The third part consists of pushing the trunk backwards and straightening out the knees. Finally the patient returns to the original position by putting the heels to the ground. During the first half of the exercises the administrator effects resistance, preventing the patient from bending his legs by a slight upward movement of his (administrator's) hands, and during

the second half of the exercise he does the contrary by a downward pressure.

A treatment carried out on the principles outlined above is the best that can be directed towards a cure of the causes of intestinal stasis. It is most beneficial in cases of toxæmia of alimentary origin, and is certainly helpful in such condition as flatulence. This applies not only to adults, but also to infants. Personally, I have seen very good results from vibrations and gentle kneading applied to breast babies. A relief of that common yet so very embarrassing complaint (caused in most cases by swallowed air) follows promptly after a single sitting.

Several authorities who took part in the recent discussion on alimentary toxæmia, held by the Royal Society of Medicine, expressed themselves strongly in favour of abdominal massage as a treatment of constipation.

D. CONSTITUTIONAL DISEASES

The main cause underlying all constitutional troubles is defective metabolism. Either it is a faulty metabolism of fats, or that of carbohydrates, or proteins, the result of it being either *adiposity*, *diabetes*, or *gout*. Anything that would stimulate the sluggish process of transformation of these matters would necessarily bring benefit to those who suffer from the above-mentioned disorders. We all know that there is no other natural way of raising the metabolism but muscular

action; in this factor we have a kind of stove in which we burn our materials otherwise wasted. Everything in the way of food taken must be either used up in the stove, or stored up somewhere in the body, or else it is wastefully eliminated. In a healthy subject either the whole amount of the introduced material is burnt, or a little of it is left over, and deposited as a reserve to fall back on in case of need.

Constitutional troubles arising from the third possibility, namely, from taking too little nourishment, are not often met with, and can as a rule be readily dealt with. In fact, diabetes, gout, and adiposity are generally accompanied by an excessive introduction of fuel which cannot possibly be all burnt in the normal way.

Restrictions with regard to food are thus of first importance, and they cannot be replaced by any other measures. However, in order to help the organism in dealing with matters under the abnormal conditions created by the disease, we must attempt to keep up a bigger fire in the stove, since this will enable the patient to get rid of the abnormal bulk of fuel which is not only useless, but can become positively dangerous. In other words, we have to break through the vicious circle set up in these cases: want of muscular action leading to an excessive accumulation of foodstuffs, and the excessive accumulation of foodstuffs leading to a decrease of muscular action. The best results will be achieved by interrupting this circle at two places: cutting off the excessive import of fuel by reducing the amount of food, and increasing the fire by introducing exercises and massage.

It would be impossible to describe special treatment for every constitutional disease. All that can be said is that the treatment here has to be general, as general are the diseases. It has to include all parts of the body, as we do not really know where the seat and the origin of the disease lie. Local applications will thus be rarely called for, if at all.

General massage in constitutional disorders consists, briefly, of the following manipulations: kneading and clapping of legs and arms, as well as kneading and hacking of the back; abdominal and neck massage; foot, leg, arm, and trunk rollings; breathing exercises. Flexion, extension, circumduction, and adduction plus abduction in all the joints where such movements are practicable, should be carried out passively, voluntarily, and against resistance, according to the patient's state of health.

Breathing exercises are especially given at the beginning and at the end of the daily sittings. Abdominal massage and trunk raising are particularly commended in adiposity, which is always accompanied by weak trunk muscles. Such treatment is here followed by a decrease of fat and an increase of muscular tissue.

The main object of mechano-therapeutics is thus to increase the oxidation of the heating materials, and the function of breathing exercises may thus be compared to a Bessemer furnace which enables us to maintain a high temperature which is necessary for the burning of excessive fuel. This certainly applies to fats and carbohydrates which are *par excellence* coal and wood in the body's household.

Similar ideas lead us to the application of massage also in those constitutional maladies which result from insufficient food absorption and assimilation due to an abnormally *low* consumption. This is the vast number of cases classed under the headline of *debility*.

We shall always be in the position to benefit these cases as long as we succeed in raising the consumption, and in maintaining a proper metabolism. We have to increase the body economy on rational lines, which means that nothing should be wasted either by being thrown away, or by being stored up.

By stimulating the appetite with physical factors such as massage and exercises, we assist the debilitated organism in a better assimilation of food. This is the reason why mechano-therapeutics are so often advocated by high authorities as a suitable after-treatment in cases of prolonged and wasting diseases, whatever their nature may be. The results achieved by massage in these patients are often astonishing, and this is also perfectly clear, since all we are aiming at is to find here a substitute for the physical actions of the body. This point ought to be always considered as soon as the normal metabolism of an individual is upset on the one hand by the disease, and on the other by want of exercises.

All that has been said about debility applies equally to *anæmia*, and other allied conditions, springing from a defective metabolism of salts (ashes), such as, for example, *rickets*.

It is true that we know very little about the inner mechanism of our body, and still less about its ups and

downs. This, however, does not justify the administration of tonics alone, which, after all, are by the majority our profession believed to be practically useless, and it also does not at all justify the disregard for other more normal measures, here described.

It may be added that in stout patients mechanical treatment can be applied very vigorously, and the fat parts subjected to an energetic kneading, hacking, and clapping; the condition of the heart, however, must be carefully watched so as not to throw on this organ more work than it can comfortably deal with.

E. URINARY SYSTEM

Though a direct influence of mechanic measures on the kidneys can hardly be effected, indirectly, so far as the improvement of the circulation is concerned, these agents prove to be of great value. Our interest must be in the first place directed towards relieving the *heart's* task, which is markedly increased in nephritic cases, so that everything which had been said in the chapter on cardiac diseases applies here.

By massage and movements we reduce the *œdemata*, and help the heart to cope with its work under such difficult conditions as high blood pressure.

Vesical troubles, such as *incontinence* and *retention*, are more or less directly amenable to manipulations. The treatment consists in these cases of massage of the bladder through the abdominal parietes, or through the rectum, or both. The patient assumes a half-lying and half-squatting position on the couch, his knees

being drawn up towards his chest, and his head being raised as high as possible. The index finger of the right hand is introduced into the rectum, and the left hand influences the bladder through the abdominal wall, in other words, the massage is bimanual. The patient may, as an alternative position, be seated in a chair, his arms supported so as to relax the belly muscles completely. Both hands are pushed into the pelvis just above the fundus of the bladder, the fingers being slightly bent, though kept rigid. Downward pressure is exercised on the bladder, which, if containing too much urine, has to be catheterised previous to treatment. The patients should be warned that the muscles may be a little tender for the first few days.

The object of this kind of treatment is fairly obvious. When incontinence is caused by a weakness of the sphincter, this muscle will become strengthened by mechanical stimuli, just as any other muscle would. When, on the other hand, retention is due to a relaxation of the detrusor vesicæ, a similar effect resulting in a better function of this muscle may be expected. If a cramp of the sphincter be the cause of retention, urine will be forced through by manipulations.

This treatment is not suitable in acute inflammatory conditions of the urinary tract; chronic catarrhal cases, however, may be greatly benefited by massage.

F. NERVOUS SYSTEM

The application of massage in nervous disorders has become so wide of late, and the results have been so

encouraging, as compared with other methods, that a more detailed consideration of mechano-therapeutics in connection with this class of maladies will be required.

For the sake of facilitating the survey, the usual classification of nervous diseases will be adhered to.

ORGANIC

1. Locomotor Ataxia or Tabes Dorsalis

The credit of the introduction of mechano-therapeutic treatment of tabes into the wider medical world is due to Frenkel. It was he who first made an attempt to put these methods on a more feasible basis, though Swedish people still claim their priority with regard to this invention, and it is very likely that such treatment was practised in Sweden long before the Swiss doctor published his ideas.

The quintessence of his scientific elucidations of what his methods in particular are meant to achieve, and in what way he thinks that they are better than all the others, could be expressed in a few words. Personally, I have not perceived any substantial difference between the various systems, but I am rather inclined to believe that the result of any of them will always be satisfactory, when carried out intelligently, no matter whether the methods be Swiss, Swedish, or English.

The counteracting of the main part of the trouble will always be the chief object of every kind of treatment. The main feature of ataxia being the *loss of the sense of co-ordination*, anything that assists in regaining the lost muscle sense must be here of value.

A patient in the atactic stage of tabes is like a little child that cannot walk properly. In both the equilibrium is impaired by a defective sense of co-ordination: the first one knew it, but lost his knowledge; the other has not learnt it yet. And just as a child by constant exercises learns how to use his limbs co-ordinately, so the atactic patient has to learn how to re-educate his limbs by constant *exercises*. In order to do that, however, it is not absolutely necessary that the patient should rigidly adhere to the exercises described by Frenkel, and which are carried out with the aid of his ingenious appliances, because these can easily be replaced by our own hands and fingers.

As the chief idea of mechano-therapeutic treatment of tabes is to teach the patient how to develop his muscle sense—in other words, to teach him to walk as other people do, and to grasp with his hands objects of ordinary life as normal individuals do—these every-day movements must be practised above all. To make the patient's task easier in the beginning of the treatment all those movements, apparently simple, have to be divided into their components, and such elementary movements practised first. Leg exercises can be practised in bed, and arm exercises at a table. The patient is told to place his heels or his toes precisely on a spot indicated by the teacher, whose hands and fingers are substitutes for Frenkel's appliances. The movements thus practised are, once flexion or extension, then abduction and adduction or rotation, their range being gradually increased, and this is gone through every day to make sure that what the patient has

learnt has not been forgotten. Each limb is first practised separately, then both legs or arms together are made to perform the same or different movements.

Walking is taught with the aid of footsteps, drawn with chalk on the floor. The steps should be small in the beginning, the interval between each being gradually increased. The same applies to the upper extremities.

Frenkel advises his patients to practise piling up round pieces of wood (not unlike draughts) or putting their fingers through small holes on a kind of chess-board, or placing small bits of wood into these holes, the latter performance being similar to the work of a telephone exchange official. But, in fact, many new exercises can readily be invented, and they will all be found useful if they only fulfil one condition, namely that of educating the sense of equilibrium.

In bad cases, that is in such cases in which the incoordination is far advanced, one has to start with passive movements which help to train the nervous tracts to receive the right reflexes, and to make the limb obey the impulses of will. As far as the accuracy is concerned, voluntary movements can become possible only by degrees.

Whether a complete and radical cure of ataxia can be achieved is rather doubtful. Great improvement, however, is the rule, and bedridden patients are often enabled to rise, and to get about. It is well known that the presence or absence of ataxia does not yet decide the fate of the patient. Other symptoms may come more to the foreground, and may cast a

shadow on the improvement of inco-ordination gained by mechano-therapy.

Bladder symptoms can greatly be ameliorated by manipulations described in the chapter on the urinary system.

Sensory disturbance, such as the *lightning pains* or the weakness of the patient, call for a general application of massage, consisting of kneading and hacking of the limbs and of the trunk.

General paralysis, but especially its form called *tabo-paralysis*, should be treated in a similar way.

2. Progressive Muscular Atrophy

(*Amyotrophic lateral sclerosis*)

Muscular dystrophy and spastic paralysis of infants (Little's disease), though presenting an insuperable obstacle to any other kind of treatment, are nearly always influenced by massage and exercises which are applied to the parts thus affected.

The *spasm* of the muscles is best overcome by passive movements, which have to be carried out energetically, though painlessly. Once the range of movements of the limbs has approached the normal, active movements will be found to be considerably easier.

The sooner commenced, the better results can be obtained by such measures, and also, had an operation been performed with the object of tendon transplantation to the spastic muscles, mechano-therapeutics form, nevertheless, a very important adjuvant to the after-treatment.

3. Acute Anterior Polio-Myelitis

(Infantile paralysis)

This is probably the only spinal disorder in which massage, as proved by the highest authorities, has always given excellent results, not even to be compared with those of electricity.

The general scheme of management of infantile paralysis ought to be the following.

Directly the febrile stage has passed, and loss of power in the limbs has been noticed, the paralysed parts must be daily subjected to rubbing, pinching, kneading, and hacking. *It is of first importance that the treatment should begin as soon as the acute stage is over;* otherwise hopeless deformities will result. The intact muscles contract considerably and stretch the paralysed ones, thus not leaving them any chance of recovery.

We do not possess any better means of preventing such undesirable consequences of paralysis than massage and movements. Very often the overstretched muscles are not totally paralysed, and have not completely lost their excitability and contractility at the time of the active disease, and only underwent an extensive atrophy as a result of disuse. Exercises therefore are indicated which stretch the contracted muscles and contract the stretched ones. Should contractures have developed before the treatment begins, *splints* or other orthopædic appliances must be made use of, as the shortened muscles have a great power of resistance. Especially during night-time light splints may be worn,

which are frequently readjusted as the improvement progresses. During the day-time massage and exercises have to be carried out as often as possible, and with great perseverance. The treatment should never be given up before six months are over, because some muscles recover very late.

When splints are used, the limb should be placed in an over-corrected position, so that, for instance, when the flexors of the wrist are contracted, and the extensors paralysed or paretic, the hand should be put up hyper-extended.

Celluloid splints have the great advantage of fitting every shape of limb, and are made precisely in the same way as celluloid jackets described above under the treatment of scoliosis.

The splint should be worn for a considerable period, and if left off must be reapplied as soon as there are any signs of relapse.

The paralysis resulting from anterior polio-myelitis tends to go back of itself to a certain extent in the first few weeks after the attack, leaving some groups of muscles completely paralysed, others only paretic; some that were powerless in the beginning recover soon, even without treatment. This fact might possibly sustain the belief that the whole of the paralysed area will recover in the course of time. This, however, has not been proved by experience. A certain number of muscles do not and cannot recover without adequate treatment, for the reasons stated above, the main reason being the tendency of the antagonistic muscles to become contracted.

Taking for granted the fact that a muscle can develop through practice, and that only muscular tissue possesses the quality of generating new muscular tissue, we can expect good results from all those muscles which have not completely perished. Where some few muscular fibres have remained untouched, there the benefit of massage and exercises is evident. Electrical treatment can, of course, be carried out simultaneously, but, if we may quote an authority like Osler, it cannot be compared in its results with the effect of the other treatment.

There are two kinds of resisted movements recognised in Sweden—*concentric* and *excentric*. One of them is considered to be particularly helpful for restoring muscular power in paralytic cases; both are executed by the patient as well as by the person administering them. In concentric exercises the patient performs the movement, resistance being executed by the gymnast; in the excentric this process is reversed. The difference between these two movements is that in the concentric exercises the amount of the resistance is determined by the gymnast, whereas in the excentric ones it is the patient himself who, according to the strength of his muscles, offers resistance.

The effect of each concentric movement is a shortening of the muscles, whilst the resistance is overcome. The effect of the excentric movement is an elongating of the muscles, caused by their yielding to the resistance.

It is held by many Swedish authorities that the excentric movements have a particularly strong restorative effect on paretic as well as contracted muscles.

4. Cerebral Hæmorrhage

In treating cases of cerebral hæmorrhage it is essential to avoid everything that might possibly aggravate the condition of the patient by unnecessary shaking of the patient's body. But, when all precautions against a renewed bleeding have been taken, it is of great importance from the first days of the illness to prevent the formation of contractures. Gentle upward stroking of the affected arm and leg, and very gentle and slow passive movements, performed without disturbing the rest of the patient, reduce the muscular spasm. Later on, when the danger of another apoplectic stroke has become considerably smaller, a more energetic treatment can be carried out. It will be found that much better results can be obtained easily when the necessary measures, as described, have been taken immediately. No time and energy are thus wasted on the correction of *contractures*, which, if neglected, become a source of annoyance to the patient as well as to the medical attendant.

This is particularly the case with the *upper extremity*, which generally becomes readily deformed, probably on account of the greater range of movements possible in its joints, as compared with those of the lower extremity, and on account of the different groups of muscles affected.

In the arm the chief muscles paralysed are the extensors, therefore the resulting deformity will take the shape of a multiple flexion; at the elbow, wrist, and finger-joints. In the *lower extremity* it is the flexors of the thigh and the extensors of the foot that suffer

most. The issuing contracture is here never so great as in the arm, but the knee is mostly extended and the ankle flexed, causing the characteristic dragging of the foot, and swinging it round in a half-circle in walking.

Should the tendency to contractures be great in spite of all the steps taken, the application of light *splints* will be indicated, and the limbs should be put up in slightly over-corrected positions. Massage is, of course, applied daily.

The use of paralysed limbs in these cases can to a great extent be reacquired by an adequate education of the nervous tracts, because there is no primary atrophy of muscles, the lesion being that of the upper neuron. Muscular atrophy in these cases is a secondary symptom, produced exclusively through want of proper exercises.

Speech disturbances, often met with in cases of right-sided hemiplegia, require similar attention. The pronunciation of single *consonants* must be practised with great perseverance, the use of a mirror being here of considerable service, as it shows the patients how to shape the mouth.

Though the extent of hemiplegia may become reduced within a month, the picture described above shows what commonly remains as a permanent result of cerebral hæmorrhage, if nothing has been done to counteract the deforming rigidity of the limbs.

Exactly the same may be said with regard to a hemiplegia following *thrombosis* or *embolism*, due to the softening of the brain, or even with regard to certain

cases of brain *syphilis*, as I had an opportunity recently to observe.

5. Neuritis

In neuritis there is hardly any other way of relieving the *pain* and counteracting or combating the *atrophy* that is as reliable as massage.

The stroking and passive movements here applied must be of the gentlest kind at the outset, but as soon as the tenderness has been lessened, and atrophy has begun to make its appearance, massage, exercises, and nerve vibrations must be carried out energetically, in order to prevent *deformity* from contracture, which may attain considerable dimensions.

Nerve friction or *nerve vibration* as practised in Sweden, and advocated by some specialists as being eminently useful in restoring nerve function, should be applied in every case of peripheral or central palsy. This manipulation consists of pressure exercised on the nerve trunks and on the bigger nerve branches, by placing the tips of one or two fingers on the nerve, and thus exciting vibratory movements, and rolling the fingers over the nerve, if it is a superficial one, such as the ulnar nerve near the trochlea, or the peroneal nerve close to the capitulum fibulæ. Vibrations are applied all along the course of the affected nerve or nerves. It is plain, however, that this cannot be a very easy performance, even to an accomplished anatomist. Benefit may chiefly be expected when the nerves treated are situated at such places where

they can be directly felt, such as the two just mentioned ones, and where they can be pressed against the bone.

Muscular reaction can sometimes be obtained by this kind of mechanical stimuli in cases where the electric excitability is practically extinguished.

Nerve friction of the type described must be repeated every day at least a hundred times, if it is to be of any use.

In neuritis massage may be advantageously combined with the application of radiant heat.

6. Lesions of Peripheral Nerves

(*a*) Cerebral Nerves

The *facial* and the *spinal accessory* are the only two cerebral nerves which, when paralysed, may successfully be treated by mechano-therapeutics.

A case of facial palsy I treated some time ago convinced me of the great usefulness of exercises in lesions of the seventh nerve, even in very obstinate cases. The patient contracted a cold, and developed Bell's palsy. Several months elapsed between the occurrence of the nerve trouble and the time I saw the girl. The nerve did not react at all to either of the electric currents; the affected muscles responded very sluggishly to galvanism, being quite indifferent to faradism. No voluntary contraction was possible in this case. In spite of a regular treatment by combined current during a few months the reaction of degeneration would not improve. Attempts were

therefore made to teach the patient to *exercise* her facial muscles *before the looking-glass*. In order to counteract the tendency of the sound side to a disfiguring deformity, and at the same time to give the paralysed muscles a chance of resting in the contracted position, strips of adhesive plaster were applied to the face so as to bring the two ends of the overstretched muscles together. Battery treatment was carried out simultaneously, and it was applied several times a week.

Within a few weeks after the patient had begun to practise her mimic exercises, consisting of shutting her eyes, lifting the corner of her mouth and drawing her mouth to the affected side, her facial muscles commenced slowly to react to faradism, and the patient progressed so favourably that the treatment could be stopped after another two months had passed; the condition of the face had then become almost normal. There was a slight difference in the promptness of electrical reaction as compared with the sound side, but nobody who did not know the girl could tell on which side the face had been paralysed. Whistling, showing the upper teeth, closing the eyes, and all the emotional movements were performed quite correctly. Of course, there was no deformity whatever when the treatment was finished, although there had already been a marked deviation of the mouth when the case was first seen.

Cases of paralysis of the spinal accessory should be treated on similar lines. Here the exercises comprise shrugging of the shoulders, respiratory movements, and

elevation of the arm, as well as rotation of the head. Massage, consisting of kneading and hacking of the upper portion of the trapezius (see Fig. 21) and the sterno-mastoid, as well as sawing manipulations carried out with the ulnar border of the hand (Fig. 30), should be given every day.

FIG. 30.—MASSAGE OF THE NECK.

Sawing movements, which are carried out with one hand, whilst the other one steadies the head of the patient.

When an operation has been performed with the view to establish nerve anastomosis, then the indication for subsequent passive and active exercises is quite obvious.

(*b*) SPINAL NERVES

The methods employed in cases of peripheral nerve lesions are similar to those applied to neuritis. Massage of the affected muscles and nerves as described above, plus passive and voluntary movements, should be regarded as infinitely more important than the electrical treatment. However, the best results will be obtained by a combination of the mechano- and electro-therapeutic measures.

The importance and the absolute necessity of preventing *contractures* so frequently resulting from peripheral nerve lesions must always be borne in mind when treating these cases.

Operations for nerve suture or nerve anastomosis in cases of nerve division should always be followed by exercises of the corresponding muscles, as there is no contra-indication to mechanic treatment whatsoever.

7. Neuralgia

Most of the neuralgic pains are often associated with *rheumatism*, and in many cases the nerves themselves are found to participate in the inflammatory process; it is best therefore to discuss neuralgia jointly with the organic nervous diseases, and not to consider these complaints as purely functional disorders.

Pain in most of these cases is due to a pressure on the nerves, exercised by the inflammatory exudations, which are actually found in and around the nerves, and are proved by anatomo-pathological investigations to consist mainly of serous infiltrations and cellular elements. In old-standing cases there may be even a certain amount of fibrosis.

Amongst the commonest localisations of this trouble are the following:

Cervico-occipital, involving the posterior branches of the upper cervical nerves, especially the inferior occipital. There is usually a tender point at the emergence of this nerve, midway between the mastoid process and the first cervical vertebra. The occipitalis major and

minor as well as the auricularis magnus nerve are also often painful at their exits from the occipital fascia. Pain in these cases is situated at the back of the head and of the neck, and forms one of the types of *headache*.

Hard and tender nodules are frequently discovered on careful examination, corresponding to the points where the nerves become superficial. Massage of these painful areas is recognised to be the most efficacious mode of treatment, and though gentle at first, it must be energetically applied, until a hard pressure exercised on the points does not produce more than the normal sensations of pressure on a nerve. Those, however, are entirely different from the heavy dull aching and gnawing or boring pain in neuralgia. The treatment may require several weeks, especially if the case is inveterate.

In patients complaining of *frontal headaches* I found the supra-trochlear nerves affected. The trochlea of the superior oblique muscle of the eye appears to be a common seat of infiltrations in rheumatic subjects. Such infiltrations must necessarily cause pressure on the neighbouring nerve branches (see *The Practitioner*, June 1913 : " Headache and its Treatment ").

Vibratory massage applied to the inner part of the orbit by means of a motor, whose shaking movements are transmitted through the hand of the person administering treatment, tends to hasten the absorption of the inflammatory products, and thus relieves the pain. The number of cases I examined before and after my first publication on this subject referred to above, is so con-

siderable that I cannot sufficiently emphasise the great usefulness of massage in frontal headaches. Nearly all my cases showed great tenderness of the trochlea to a slight pressure, and were markedly relieved after a comparatively short treatment (Fig. 31).

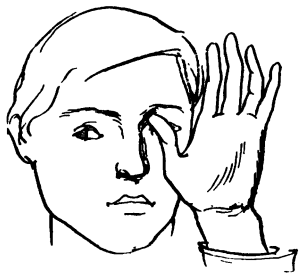

FIG. 31.—THE ABOVE DIAGRAM SHOWS THE POSITION OF THE THUMB WHICH ENABLES ONE BEST TO EXAMINE THE TROCHLEA OF THE SUPERIOR OBLIQUE M. IN ONE'S OWN SELF.

The supra-orbital and the infra-orbital nerves are also often involved in *facial* neuralgia. This, however, is to my knowledge not nearly so often the case as compared with the supra-trochlear nerve. Pressure on these nerves at their emergences is always followed by relief, which is more obvious and lasting than that obtained from a sole administration of salicylates.

Forcible kneading of the tender points, executed by the tips of both thumbs, will be found very helpful in most cases.

In *brachial* neuralgia it is most commonly either the circumflex or the ulnar nerve that is at fault. In the first case the pain is situated in the deltoid; in the second, tenderness is complained of about the elbow

joint just at the point where the ulnar nerve winds itself round the lower end of the humerus. It is often met with in cases suffering from muscular or arthritic rheumatism, or in those patients that sustained a trauma at some time or other. It is then most likely due to an extension of the trouble from the vicinity, or to the pressure of the exudates on the nerves.

Massage is always found to bring relief to those pains, but the period of recovery is sometimes extended over months, particularly when the case has been neglected.

In *sciatica* the pain is either caused by neuritis of the great sciatic nerve, or it may be due to infiltrations of the glutæi muscles, the swelling pressing on the big nerve trunk. Massage requires here considerable physical strength on the part of the person in charge of the case. Kneading of the buttock and of the thigh is best executed by the knuckles of the fingers of both hands, the fist being firmly clenched. The patient assumes a recumbent posture, lying on his face.

Exercises comprise here those of the trunk, such as bending, and of the leg, such as flexion of the thigh with fully extended knees. The range of these movements is steadily increased with every day.

Coccydynia, which as far as its obstinacy is concerned is one of the worst complaints known, often results from a cold or a bruise. Manipulations tending to loosen the coccyx, and to help to disperse the residue of either inflammatory or traumatic origin, will be found very helpful. The forefinger of one hand is introduced into the rectum, the other hand steadies the bone from outside.

Podalgia, or painful feet, is in the majority of cases caused by a weakening of the arch, thus representing the first stage of pes valgus, *sive* planus, and as such it is directly amenable to mechano-therapeutic agents. Massage of the foot and leg muscles, and exercises which were described more in detail under the treatment of flat-foot, will in most cases bring a prompt relief.

The same should also be practised, and given a good trial, in cases of *metatarsalgia*, before recourse is had to an operation.

FUNCTIONAL DISEASES

1. Paralysis Agitans

Cases of Parkinson's palsy have been reported which were greatly ameliorated by gymnastic treatment combined with muscular kneading and stroking, though this condition has so far defied any other kind of treatment. The only case I treated showed signs of improvement with every day, but, unfortunately, treatment in this case did not last very long, the patient being unable to continue attendance at the hospital.

Whether the effect of mechanic treatment is purely suggestive, or whether it has a real therapeutic value, cannot and need not be decided as long as the nature of the disease itself is obscure.

Resisted movements were found of the greatest use in this case as a means of steadying the tremor.

2. Chorea

The method of treating St. Vitus's dance with gymnastics is becoming more and more popular, but great care must be here exercised both with regard to the selection of suitable cases, as well as to the kind of treatment. One rule must be unconditionally adhered to, and this is *individual* treatment of every child, away from school, but never together with other children.

We know that the psychic moment in chorea is of great significance. We often cannot even determine the extent of its importance as long as the patient is not entirely separated from the atmosphere of the school and its home. This alone categorically demands an interruption of school work. On the other hand, choreatic individuals differ so much from one another that it is quite impossible to treat them all on exactly the same lines. They differ very much physically as well as psychically, and therefore the measures applied to them must vary accordingly.

The more severe cases of chorea ought not to be treated by gymnastics, but should receive *massage alone.* General massage should be carried out in the way described under constitutional diseases. Stroking of the limbs is very soothing, having a remarkable sedative influence on the inco-ordinate movements. If possible, the child should be confined to bed for a few weeks and secluded from the rest of the family. The effect of massage combined with absolute rest is always much more prompt than if given under the ordinary unfavourable conditions.

Lighter cases should receive mechano-therapeutic treatment in a less restricted form. *Resisted movements* will then be found most useful. The degree of resistance must, of course, be exactly proportionate to the physical resources of the child, so that no undue fatigue shall be caused. The resisted movements, more than any others, force the patient to direct his full attention to the muscular actions performed, and teach him to carry out voluntary movements with more precision.

Complications of chorea, such as endocarditis in children or pregnancy in adult women, obviously require special consideration.

3. Occupation Neuroses

Writer's cramp is undoubtedly the commonest representative of this group. Much can be done to avoid aggravation of this condition by correcting the position of the arm in writing. The elbow must always be supported on the table, and must serve as the centre from which the movements originate; neither the little finger nor the wrist should be used in that sense. Sometimes the change of the penholder may bring an improvement in lighter cases—a thick penholder instead of a thin one, or vice versa. Occasionally it is found that placing the pen between different fingers unaccustomed to hold it brings relief.

Unless scrivener's palsy is due to some mental causes still obscure to us, it appears to be frequently a sign of over-fatigue of those muscles which are involved in the

process of writing. Hence a temporary amelioration generally follows the above-mentioned suggestions.

A more rational and a more effective treatment, however, consists of complete interdiction of any writing, and of massage applied to the whole arm as far as the shoulder, resisted movements in the finger, wrist, and elbow joints being carried out daily.

The patient is gradually allowed to resume writing within a fortnight or three weeks.

Masseur's palsy—which, strangely enough, not only exists, but is said to be pretty frequent, especially in Sweden, where some work almost incessantly for ten hours daily and even more—affects mainly the shoulder muscles. It manifests itself in a feeling of fatigue and pain all around the shoulders, and an inability to perform movements which entail a strain on the shoulder muscles.

Treatment consists of rest and avoidance of all those actions which cause dragging of the affected muscles. The ideal treatment of these cases is rest in bed and application of massage to the overstrained parts. Gradually gymnastics are allowed, but great caution is to be observed lest the pains should return. In these cases the use of electric vibrators ought to be a boon to the patients just as the use of typewriters in the foregoing complaint.

4. Hysteria and Neurasthenia

The significance of the therapeutic effect of massage in these two troubles was fully realised by Weir Mitchell, and also constitutes an important part of his method.

It is intended to stimulate the metabolism, and by regulations of diet to lead to an accumulation of fat in the body. With regard to neurasthenia, and particularly with regard to such forms of it as are characterised by a marked loss of flesh and disappearance of fat—instances of which we have in Glenard's disease (*enteroptosis*) and in the movable kidney—the beneficial effect of such treatment is obvious.

In more serious cases, rest in bed is of great help when massage alone should be applied to the whole body. This is given in the way found suitable in constitutional disorders, which undoubtedly resemble neurasthenia very closely.

Exercises are prescribed as soon as the patient's physical strength will allow it. In the beginning very gentle and passive, later on active and resisted, they have to be given for several weeks or months.

Breathing exercises and *abdominal massage* should always be practised, because of their direct influence on metabolism.

III. SPECIAL

A. GYNÆCOLOGICAL AND OBSTETRICAL

THE following points, though being well known to every man in the profession, may be mentioned in connection with this chapter.

One is the mechanic stimulus widely adopted in obstetrics and applied to the uterus, consisting of rubbing of the womb through the abdominal wall, with the object of preventing *post-partum hæmorrhage*. This massage is carried out in order to effect a better contraction of the uterine muscle, and as such it should be performed as a routine measure in every case: first after the child has been born, and then after the placenta has been expelled. One or both hands are placed over the fundus, and quick rotatory movements are executed with a fair amount of vigour.

The same manipulations are often applied in cases of *protracted labour*, when due to defective pains, and it is remarkable to what extent and with what promptness contractions follow this massage.

Another mechanic factor familiar to the obstetrician, and frequently practised by him, is the *resuscitation* of asphyxiated new-born children. It is based on the principles of our breathing exercises, but at the same

time use is being made here of the law of gravitation. When the infant is held up by the shoulders, his thorax is fully expanded; in lifting him up, his head downwards, the lower part of his body becomes suddenly bent. The thorax thus becomes compressed, and a deep expiration results. At the same time more favourable conditions are created for the escape of mucus from the trachea, by the body being turned upside down.

The introduction of mechano-therapeutics into gynæcology proper was accomplished by Thure Brandt, the Swedish major, some forty years ago. It consists of bimanual manipulations in which the index and the middle finger of one hand introduced into the vagina steadies the portio, whereas the other hand influences the fundus uteri through the abdominal parietes by a kind of kneading and pinching movements. Brandt and his followers practised gynæcological massage in cases of *prolapse*, uterine *displacements*, as well as in all *chronic inflammatory* conditions of the uterus itself, and of its vicinity. In the first-mentioned complaint the manipulations are intended to strengthen the uterine ligaments. In the endo- and para-metritis they are meant to hasten the absorption of inflammatory products from the affected areas, and to loosen the adhesions. In metritis it is to relieve the venous congestion, and thus to improve the circulation in this organ.

Though in itself quite plausible and useful in suitable cases, T. Brandt's methods have not found a wider application, especially in this country, on account of

certain objections raised here and there by the medical profession. The objections are not very convincing to those who consider the freedom of science and the well-being of their patients of infinitely more vital importance than misdirected ethical scruples. Certain precautions directed towards the protection of the profession as well as of their clientèle, are always indicated. On the other hand, however, there is no essential difference between the ordinary work of a conscientious gynæcologist, and that of a conscientious man, as Thure Brandt himself undoubtedly was. At any rate, this was the impression I gained from a perusal of his private notes in MSS. to be found in the Library of the Central Institute in Stockholm.

It would be wiser to afford more opportunity of rehabilitation to a method which, though not always approved by some authorities, cannot otherwise but appeal to common sense, and which has been vindicated by its own results.

Massage can be used in the last stages of pregnancy as a preventive of skin cracks (*striæ gravidarum*), otherwise readily forming on the abdomen, and sometimes even on the thighs. The *skin alone* ought to be here the subject of very gentle kneading executed with the tips of the fingers. Also the *nipples* of the breast require similar attention, being very liable to suffer from the process of suckling, if not previously hardened by rubbing with such stimulants as methylated spirits, which should be commenced about six weeks before the confinement and practised every day.

With regard to the lower extremities, which often

suffer a great deal from œdema, pains, and even open wounds as the result of *varicose veins*, it must be emphatically pointed out that stroking and kneading of the legs are strictly indicated in order to cope with the congestion. Exercises of the legs and of the trunk help to restore normal circulatory conditions of the body, and may rightly be expected to diminish the risk of *thrombosis* of the femoral veins, this much dreaded complication of the early stages of puerperium. Later on, trunk exercises and abdominal massage are of great service as restoring the strength of the *abdominal muscles*, which in most cases are extremely weakened. In fact, gentle exercises, such as voluntary contractions of the recti muscles whilst lying in bed, should be practised from the second day after parturition. Also small sacks filled with sand may be placed on the stomach after a few days, and the patient told to lift them by contracting the abdominal muscles. The *perineal muscles* may be trained even before the confinement by voluntary contractions, imitating those which generally accompany the act of defæcation and those which serve to keep back the contents of the rectum. This may be practised several times a day, the object here being prevention of subsequent relaxation of the perineum, which favours prolapse of the uterus.

B. OTOLOGICAL AND OPHTHALMOLOGICAL

MASSAGE has found its way even to such special branches of our science as otology and ophthalmology. Obviously it has here but a limited scope. Nevertheless, it is the

ear and eye specialists themselves that advise the application of massage in certain complaints.

Vibratory massage applied to the mastoid process by means of an electric motor is advocated by some as beneficial in cases of *otosclerosis*. The aim of the treatment is here loosening of the ossicles, and it appears that massage is the only way of influencing this dreadful disease. Vibratory massage can also be advantageously applied in cases of *chronic otitis media*.

Massage used to be applied by oculists in cases of *immature cataract* in order to hasten the degenerative process going on in the lens by rubbing it with Daviel's spoon through the cornea. A few days after the lens could be extracted.

C. RHINO- AND LARYNGOLOGICAL

Some troubles affecting the throat such as *laryngitis* and *pharyngitis* have been dealt with jointly with other affections of the air-passages in the chapter on the respiratory system, and therefore need not be described here again.

With regard to the nose troubles, one or two things have to be mentioned.

Firstly, massage has been applied to the nasal mucous membrane in cases of *atrophic rhinitis* with the aim of stimulating the regeneration of the tissues. Gentle friction has been exercised on the mucous membrane by means of a probe, whose point has been protected by a small quantity of wool. It is obvious that such treatment can yield more satisfactory results only after a certain period.

Secondly, we adopt mechano-therapeutics in the after-treatment of cases which have undergone an operation for *tonsils* and *adenoids*. The object of these measures is mainly an improvement of breathing, which is always more or less impaired in these cases, owing to the obstruction of the naso-pharynx. The resulting abnormality is here a double one: breathing becomes shallow, and the air passes through the mouth instead of through the nose. What we have to do is, therefore, to teach these subjects (mostly children) how to breathe deeply and through the nose.

Breathing exercises such as have been described under scoliosis treatment and also in connection with respiratory troubles, are applicable here. Class exercises [1] can be adopted with a greater benefit than elsewhere, since this type of patient as a rule does not require much individual attention. Such exercises will consist of the said movements carried out while standing, and deep inspiration to be performed through the nose, followed by expiration through the mouth without holding the breath between the movements. Breathing exercises must necessarily be performed slowly, though regularly, and according to the instructions of the teacher.

The effect of this kind of treatment is a more complete ventilation of the lungs, an increased vital capacity of the thorax, and at the same time it helps to exterminate the faulty habit of mouth-breathing.

In order to achieve better results, breathing exercises must be performed daily.

[1] As described on p. 64.

D. DERMATOLOGICAL

OUT of the vast number of skin troubles only a few can be influenced advantageously by massage.

Alopecia, when not of parasitic origin, is amenable to a treatment of which the object is to raise the vitality of the scalp. This is effected by manual kneading and friction applied with the tips of the fingers in order to loosen the scalp, to produce an active hyperæmia, and thus to stimulate the hair follicles, and to promote the growth of the hair. If possible, massage of the scalp should be practised every day once or twice, the patients being often able to administer it themselves, when properly instructed.

Massage of the face is nowadays more and more adopted as a rational treatment of *acne*. What had been termed "plastic massage" by some French authors should be applied to the face in order to reduce the amount of blackheads, and to prevent the formation of pustules. This massage consists of gentle pinching and kneading of the face between the tips of the fingers. The skin has to be lifted off the cheeks and off the chin, as well as off the forehead, and carefully submitted to the above-mentioned process. This is very beneficial as a means of opening the many cutaneous glands which, being blocked by the accumulated débris, give rise to the formation of the two above-mentioned symptoms.

E. DENTAL

MASSAGE has been advocated by eminent dentists in cases of *chronic gingivitis*, a condition much more wide-

spread and important than is generally supposed. The main features of this complaint are a loss of tonus in the gums, leading to a weakening of the teeth, and a state of chronic sepsis in the mouth.

Massage here is prescribed with the object of strengthening the gums and in assisting a free elimination of the discharge. This is effected by a vigorous kneading of the gums, the tips of the fingers performing gliding movements in an upward direction in the case of the lower jaw, and in a downward direction in the case of the upper jaw. The fingers are from time to time dipped into pure spirits of wine, the latter adding still more to the hardening of the tissues.

This kind of massage ought to be practised every evening by the patients themselves after a thorough cleansing of the mouth has been performed. Personally, I had the opportunity of convincing myself of the efficacy of this treatment.

CONCLUDING REMARKS

SHOULD the foregoing pages have succeeded in raising the interest of some of their readers, and in directing it towards a closer and more unprejudiced, but a personal study of mechano-therapeutics, the author will feel that his efforts have not been quite futile. For it always was his intention to acquaint a wider circle of his colleagues with a therapeutic factor which has been badly neglected by the profession.

Massage has up to quite recently been in the hands of quacks and unqualified persons, and on that account medical men have been accustomed to look down upon it as something beneath their professional dignity. This is, however, not the right way of tackling a new method. Some two or three hundred years ago surgery was in the hands of barbers, but nowadays this does not prevent anybody from considering it one of the most favourite branches of our work.

The larger public was of yore inclined to believe in the efficacy of massage, and the quacks must have undoubtedly been of some service to them. Although the results were sometimes anything but satisfactory, such failures might have been easily avoided, if the medical profession had thought of a thorough investigation of this matter, instead of pronouncing them-

selves far above it, and treating massage as a *quantité négligeable*.

Lack of scientific training obviously made ignorant people apply exactly the same treatment in all cases without discrimination, and though they obtained excellent results in some, they had disastrous failures in other cases, since massage, harmless as it may appear, can sometimes cause very sad complications. Pyæmic metastasis has occurred after an abscess had been submitted to rubbing, and a general peritonitis followed the massage of an acute appendicitis. Gross displacement of bone fragments resulted in fractures treated by people who had no knowledge of surgery. A case I saw once exhibited osseous union of the femur at an angle of 120°, as proved by a radiograph.

The results of mechano-therapeutic treatment would become positively excellent if medical men would take up this work themselves, and rely less on others. It would be a greater benefit to the public, as well as a greater advantage to the profession, if the motto "More medicine in massage, and more massage in medicine," were generally adopted.

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